Vol 131 - No 1 1906.

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Sanitation as Practised in the Japanese Army. जनवरी Vol 131

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Sanitation in its Relation to Public Health. Jan 1906

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Vomiting of Pregnancy.

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Dirty Milk and Infant Mortality.

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CONTENTS.

SPECIAL ARTICLE.

ORIGINAL ARTICLES.

REVIEWS.

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

WILLIAM OSLER, M.D., AND W. S. THAYER, M.D.

SURGERY.

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D., AND T. TURNER THOMAS, M.D.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD WEBB WILCOX, M.D., LL.D.

ASSISTED BY

HENRY HUBBARD PELTON, A.M., M.D.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.

OBSTETRICS.

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.

GYNECOLOGY.

UNDER THE CHARGE OF

HENRY C. COE, M.D.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

WARFIELD T. LONGCOPE, M.D.

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G. CANBY ROBINSON, M.D.

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OF THE MEDICAL SCIENCES.

JANUARY, 1906

SPECIAL ARTICLE.

ON THE INFLUENCE OF LIGHT IN THE PRODUCTION OF CANCER OF THE SKIN.[1]

By James Nevins Hyde, M.D.,
CHICAGO, ILL.,
PROFESSOR OF DISEASES OF THE SKIN, RUSH MEDICAL COLLEGE, CHICAGO.

In its etiological relations, cancer of the skin seems to present a contrast with that disease as it affects other organs of the body. The brief survey which it is here purposed to make is limited to a consideration of the effective causes of the cancerous change in the integument only; and the terms epitheliomatosis and cancerosis, when here employed, are given a similar restriction. The words designate that condition peculiar to the skin itself, and not necessarily related to any other organ of the body or to the condition of the system at large, as a result of which there is developed a distinct tendency to the production of cutaneous epithelioma. This tendency may be declared: first, by the occurrence of multiple lesions of cancer in a single region of the skin of one individual; second, by the dissemination of lesions in different regions of the same body surface; third, by the evolution of multiple lesions in one person, which, though not all distinctly cancerous, yet represent stages in that change which eventually produces typical cancer of the skin.

In considering the causes of these conditions it is not essential that any one of the classifications of the carcinomata of the skin be

[1] Read by invitation before the Medical Club, Ann Arbor, Michigan, November 8, 1905. The author expresses his obligations to his laboratory associate, Dr. Oliver S. Ormsby, for mounting sections of skin and for other valuable aid in the preparation of the paper.

accepted. It is generally agreed that the common tubular, cylindrical, or alveolar types of cancer with their eventual production of circumscribed acini or diffuse infiltrations, as well as the more malignant pavement types having a greater body of protoplasm in the cell-mass and furnishing horny pearls and nests, are pathologically one. The same may be said of the vegetating or fungating types where the epithelial proliferation is manifestly a modification of the growth as it occurs near the mucocutaneous orifices. The ulcus rodens (Jacob's ulcer), the adenoid epitheliomata, and the varieties, if such they may be termed, which spring from nævi, from senile warts, corns, and horns; and from traumatisms and infections of both the sound and the diseased skin—these all represent variations of a single morbid process. That process is an invasion of neighboring tissues through the avenue of the lymphatic spaces by epithelial cells.

The effective causes of this change, which may be pushed to a point where the destruction of life results, have been studied with the utmost zeal by competent observers. Within a recent date researches on the subject have been conducted by scientifically trained men in laboratories where the work is pursued by the aid of generous benefactions and on the basis of large endowments. As yet, however, agreement has not been reached respecting the essential factors in the genesis of this scourge of the human family.

The chief causes of cancer heretofore assigned by writers on the subject may be classed as follows: First, a proliferation of the epidermis proceeding from stray bits of the germinal layer separated in the embryo from their proper attachments and included in the growing tissue (Cohnheim); second, loss of equilibrium—pressure and counterpressure—between the epiderm and the corium; third, disturbance of equilibrium between waste and repair; fourth, congenital tendency to reversion of epidermal cells to a simpler and undifferentiated type; fifth, parasitism.

There are many, and they may be described as seductive, reasons for seaching for a parasite as the cause of cancer. It is somewhat difficult to conceive that the human body is so large a proportion of cases without the introduction of a foreign element, can evolve a growth of such malignant potency. A few clinical cases have seemed to point to the direct transmission of a cancerous lesion from an infected to a sound individual. On occasions, cancer has occurred with special frequency in groups of patients having the same environment and even in the same family. Surgeons have supposed when operating upon malignant growths that they may have introduced bits of epithelial tissue into wounds, which eventually became cancerous, of normal organs of patients

Ladame, after discussing the efforts of Peyrilhe, as early as the year 1773, to discover the supposed pathogenic agent of cancer, briefly reviews the work of Virchow, Malassez, Albarran, and

Pianese; and discusses the character of the supposed parasites described by Russel, Malfucci, San Felice, Plimmer, and Feinberg. He concludes with the suggestive statement that the "study of the process of disintegration alone can enable us to reach the origin of these bodies and to explain their true significance." The men in Chicago who have had amplest opportunity for observation of blastomycosis know that the organisms they have recognized as effective in the production of that disease, bear no relation to the cancerous change. The differential diagnosis, bacteriological and clinical, between blastomycosis and carcinoma of the skin, has been set forth so clearly in the voluminous literature on the subject that confusion hereafter can scarcely occur. The phenomena of cell inclusion have been thoroughly investigated.

Hoffmann, studying the spirochætæ, recognized by Schaudinn and himself, admits that they have not been seen in closed carcinoma nodes. Bosc is still busied with the phenomena of "tag-rot" epithelioma as due to a true intracellular parasite, affirming that the inclusions are not the product of cellular degeneration. Noesske and Feinberg busied themselves with protozoön forms supposed to be effective in the production of carcinoma; and the former in his conclusions admits that the present investigation of the cancer parasite may be regarded as neither essential nor with an outlook.

Nichols summarizes the results obtained by the investigations conducted under the direction of the Cancer Commission, by stating (*a*) that the coccidium-produced lesions are essentially products of chronic inflammation and are not analogous to those found in cancer; (*b*) that molluscum lesions are not analogous; (*c*) that the lesions produced in blastomycosis are not cancerous; and (*d*) that the peculiar bodies seen in the protoplasm of cancer cells are not parasites nor the cause of the lesions.

A decided reaction seems at last to have set in against the tide which bore in the direction of the parasitism of cancer. Orth, for example, declares respecting an intracellular parasite, that it "cannot possibly in itself be the decisive factor in the new-growth." In the "Report of the Imperial Cancer Research Fund of Great Britain" the inadequacy of the factors assumed in the past to be effective in the production of cancer has been affirmed. The supposed epidemics of cancer have been explained by adducing facts showing the age incidence of the disease. Many of the bodies, which it was once believed would prove to be parasites, are now known to be irregular cell inclusions. The incommunicability of cancer to the lower animals who are, however, known to suffer from metamorphoses of a similar type, is conceded. These and other considerations which need not be cited in full have for the moment certainly diverted the attention of scientific men from the hypothesis of parasitism in cancer. To them may be added the well-known clinical phenomena that demonstrably parasitic diseases,

such as blastomycosis, actinomycosis, and tuberculosis, have proved in exceptional cases sources of danger by their transmission to physicians and surgeons; that these affections rarely display lesions with immense preponderance in one region only of the body; that they are seldom characterized by a definite incidence at specified ages of the subject; and that in many instances they can be shown to have their departure at a given moment of time when the fact of infection and often indeed when the precise source of that infection may be recognized.

My apology for venturing on a field, which it would seem distinguished investigators have thus far vainly explored, is not to advance a new theory of the etiology of cancer, nor to put forward any hitherto unknown facts. It is rather to direct attention to a group

FIG. 1

Group of three of the author's patients, showing in each lesions of xeroderma pigmentosum; brother and two sisters.

of certain recognized facts which give promise to the lines of future advance. The suggestions which follow are the fruit of a recent study of three cases of xeroderma pigmentosum which came under my observation and which were demonstrated by me before several medical bodies.

Xeroderma pigmentosum would appear to furnish one of the object lessons fittest for the study of the genesis of cutaneous cancer. It is possibly because of the great rarity of the malady that thus far it has failed to awaken the interest of many physicians who do not give special attention to diseases of the skin. There are perhaps 100 well-established cases of the disease in the records of medicine.

Xeroderma pigmentosum may be fitly designated as a childhood cancerosis. The special facilities it offers in the investigation of

the etiology of epithelioma spring from the striking fact that the subjects of the disorder are of such a tender age. They have never been subjected to the accidents of adult life; to the exposures of the day laborer; to the frictions incident to toil; to the artificial habits of the consumer of tea, coffee, alcohol, and tobacco; to the habitual stress and strain of most men and women of mature years.

Briefly, the features of the disease may be enumerated as follows: There is, first, beginning commonly about the second year of life

FIG. 2

Section of epithelioma removed from the eyelid or one of the author's patients; male child affected with xeroderma pigmentosum.

Vascular dilatation and perivascular infiltration extend to hypoderm; absence of glands; œdema and pigmentary depots; collagen and elastin largely destroyed and replaced by dense infiltration composed of small round cells reverting to embryonal type, connective-tissue cells, plasma cells, and polymorphonuclear leukocytes.

Acanthosis of rete increasing toward border of ulcer; lengthening of rete-pegs; thickening of stratum corneum and parakeratosis; stratum granulosum not distinguishable. The malignancy of the neoplasm is indicated by the absence of cell-nests, and of any point of rupture through the basal layer. At the extreme edge of the section pigment occurs in the greater part of the hypertrophied rete.

a distinct cutaneous hyperæmia followed by a uniform, discrete pigmentation of the exposed parts of the body, with the result of a symmetrical freckling of the skin in brownish tinted macules. As the development of the child proceeds, the freckling is accompanied by much roughness of the surface; there is hyperæmia and puffiness of the lids; the conjunctivæ inflame; there is consequent photo-

phobia; and, later, mother-of-pearl-like whitish spots become perceptible between the pigment macules. Minute telangiectatic vessels gradually form in and about the other lesions named, and often small isolated angiomata are scattered among the other oddly associated symptoms. Finally, warts are formed, almost exclusively over the affected parts, and even at this tender age epitheliomatous growths develop, classical in type, usually multiple, often of most malignant career. No one has questioned the cancerous nature of these degenerating neoplasms, and their active part in the production of the fatal results which conclude the most of these childhood histories. In my experience the earliest and most precise statement of this fact was made by the late Professor Quinquaud, in demonstrating a patient affected with this disease before the International Congress of Dermatology, held in Paris in the year 1889. "This," said the distinguished clinician of the St. Louis Hospital, "is absolutely and unquestionably an instance of presenile epitheliomatosis." Since then Unna and others have fully confirmed the fact conclusively proven in the section shown, removed from the eyelid of one of the three patients under my observation. Unna believes that the uppermost layer of the cutis is chiefly concerned in the hyperæmia; the melanosis occurs at the under angles of the epithelial ridges; the papillary body widens as a result of vascular dilatation; the epithelial cells undergo extensive metamorphosis; the horny layer thickens; later, the connective tissue; and, finally, true unpigmented carcinoma develops by invasion of the connective tissue, at first by the pushing downward of epithelial buds, later by cylindriform processes of epithelium advancing from the broad layers above.

Unna, and almost all who have studied these cases with equal care, point to the indisputable fact that this chain of morbid phenomena has its genesis in the weakened resistance of the skin of the young child to the more refrangible rays of the solar spectrum, the hyperæmia and pigmentation being "simply different endeavors to paralyze the injurious influences of light." The surface hyperæmia acts like the red light of the photographer in the way of exclusion of the ultraviolet and blue rays which are the effective agents in the production of the mischief. If sufficiently generalized, the melanosis might possibly have secured for the victim of the disease absolute immunity. Unna shows that as the melanotic granules permeate not merely the epithelium, but also deeply the papillary body and the cutis, they form a black net directly communicating with the pigmented lymph spaces of the prickle layer.

Here, then, we have a true carcinosis of childhood directly traceable to the action of the more refrangible rays of the solar spectrum and strictly limited to the exposed parts of the body for its severest manifestations, severest for the reason that the clothing of children especially, and this at the season of the year when the light is chiefly

PLATE I.

Xeroderma Pigmentosum, showing Pigmentation, Telangiectasis, Atrophy, Patches, and Beginning Carcinoma in a Child.

(From Hyde and Montgomery on the Pathology of the Disease.)

effective, does not offer a perfect barrier to the light. In the young girl whose portrait in oil is shown (Plate I.) examination of the nude body revealed very distinct freckling running irregularly along the spine in the shape of an inverted wedge with its base at the exposed part of the neck above, and its apex near the lumbar region, while the lower limbs also, and even the anterior face of the body covered for the most part by the clothing, were freckle-sprinkled, the fainter lesions being invariably at the greatest distance from the region directly exposed to the light.

"Carcinoma of the sailor's skin," also described by Unna, suggests the operation of the same cause and in similar lines. In these cases the ears, the cheeks, the temples, the backs of the hands, and of the fingers first become mottled and pigmented; later, non-pigmented islands of skin develop between the freckles, thickening, roughening, and cornification of the horny layer follow, and eventually, as in xeroderma pigmentosum, the sebaceous glands become hypertrophied and indolent, cancerous growths of the "rodent ulcer" type form. The histopathology of this affection, save in minor details, is suggestive of the processes recognized in xeroderma pigmentosum. There is both hyperkeratosis and acanthosis; conical horny taps push downward into the corium; the lymph spaces of the latter become largely dilated; the mast cells multiply, fissures form, and finally papillary cancerous growths furnish flabby ulcers which refuse to heal.

These instances of malignant cancer occurring obviously as a result of exposure to light justify the inquiry whether all cutaneous cancers are not influenced in their origin and career by the actinic rays.[1] It would be venturesome, without the accumulation of strong proof, to make a broadly affirmative answer to such a question. There is, however, a fine distinction to be drawn between a catastrophe and the circumstances which invite it, between the actual genesis of epithelioma and the condition of the skin which makes epitheliomatosis possible and even probable. The question can be better put by asking whether actinic rays of light unfavorably influence not all but certain sensitive skins at definite ages of the body in the direction of the epitheliomatous metamorphosis.

At the outset of such an inquiry there are several established facts which should be remembered. No one can deny the effectiveness of traumatism (picking and scratching) and pus infection among the inciting causes of cancer of the skin. On the other hand, it is obvious that among the hundreds of thousands of men and women

[1] Freund and others have shown that the blue and violet, as well as the ultraviolet rays, exert a marked influence upon the skin. In these pages it has not been essential to discriminate between them. The terms ultraviolet, actinic, chemical, high frequencies, etc., employed by authors generally, are here intended to designate the effective rays both within and beyond the violet end of the spectrum.

who have attained the age when more than at another cutaneous cancer occurs, the skin can be made the seat of traumatisms and of local infections, when a very large majority of those thus attacked will assuredly not suffer from cancer and the few become its victims. Here, then, is a difference of susceptibility requiring explanation.

It is also to be remembered that pigmentation of the skin, especially hyperpigmentation, though occurring in cases as a consequence of malignant systemic disease, admittedly furnishes an exceedingly valuable protective screen for the body. The dark skins of the Asiatic and the African unquestionably possess for them an enormous value, even though it be admitted that with respect to other than cancerous disease, the colored races pay a price for this special immunity. In vitiliginous patches, for example, where the pigment has once been completely removed, it almost never returns, and these leukodermatous spots, when unduly exposed to sunlight, suffer out of all proportion to the areas of adjacent skin which have preserved their normal pigment. The albino, without trace of pigment either in the skin or the choroid coat of the eye, is notoriously feeble of body and short-lived.

The researches of Loeb, Gruber, Dubois and others on the orientation of plants and animals throw some light on this subject. They indicate clearly that heliotropism is influenced largely by the more refrangible rays of light; that the protoplasm of the body has a tendency to become richer and more active in metabolism at the extremity or side where heliotropism occurs; that the oral pole of the lower animals is heliotropically more irritable than the aboral pole; while—a most important point—heliotropical irritability frequently manifests itself only at certain epochs of life. Lastly, at a constant intensity light operates as a continuous source of stimulation. In other words, the study of the action of light on the lower forms of both vegetable and animal life points to the probability that in man exposure to actinic rays produces a perceptible stimulation of the skin; and that this stimulation is effective in proportion to the special irritability of the integument on which it falls.

The physiological and pathological effects of the ultraviolet frequencies, the *x*-rays, the Becquerel and Niewenglowski rays, the radium radiations, and the other rays recognized beyond the violet end of the spectrum, to which various names have been given, are for each similar. On *a priori* grounds this might have been anticipated, as each is practically a different mode of motion, and all are probably interchangeably effective. Chemical rays playing upon the sensitive and unprotected skin produce in order: First, hyperæmia; second, pigmentation; third, atrophy; fourth, cancerosis. Telangiectasis often occurs as a secondary consequence. The first two changes are obviously protective in character, the red blood brought to the surface furnishing an effective

screen against the actinic rays. This has been demonstrated by a familiar experiment. A sensitive photographic plate held behind a rabbit's ear is not darkened until pressure is made excluding the flow of blood through the organ. When thus temporarily exsanguinated, actinic rays are projected through the tissue of the ear and the photographic plate is blackened.

After hyperæmia pigmentation follows, a process also protective in character; and next, only when the play of the irritant rays over the skin has been intense and prolonged, hyperkeratoses develop, intermingled or not with atrophic discs, and patches develop where the shrivelled cells of the epidermis and adjacent connective tissue have been disposed of by outwandered phagocytic cells multiplying during the hyperæmic stage. Lastly, the cancerous change is established.

It is important to recognize the connecting links in this chain of events associated with all radioactive phenomena, for the reason that in the case of the rays most carefully studied, therapeutical are intimately bound up with pathological results. Thus the action of the Finsen light upon the skin produces a well-known reactive hyperæmia, though the technique of its application demands that the area to be treated should be made as exsanguine as possible by pressure in order to permit the passage of ultraviolet rays to the skin. With this end in view an attendant is required to press firmly upon the patch of the skin subjected to the ray a cell of quartz crystal through which water continuously flows and which is held in position during the entire séance.

The remedial effects of the Finsen light, as is well known, have been best illustrated in the removal of the soft embryonal cells of lupus vulgaris (one of the common forms of cutaneous tuberculosis), but none the less the rays have been found effective also in epithelioma. Bee, for example, reported that 7 of 16 cases of epithelioma were cured by "concentrated light," the diagnosis having been verified in all patients by microscopic examination of sections, the subjects of the disease remaining for from six months to two and a half years free from the malady.

The action of the *x*-rays upon the cutaneous surface is strikingly similar to that of the ultraviolet frequencies. First, after their employment with due precaution, occurs a vivid hyperæmia, delayed longer than is the Finsen reaction. This is followed by well-marked pigmentation more conspicuous in some cases than others. Later, as in the results of actinic ray bombardment, atrophy may result, the overstimulated protoplasm losing its vitality, the cells and their nuclei shrinking, while phagocytosis, as in other cases, disposes of the epithelial debris. But hyperkeratosis and finally cancerosis may occur. The *x*-ray production of cancer of the skin, reported by Mendes da Costa, White, Bowen, Pusey and others, is established by other incontrovertible evidence. Fortunately, the

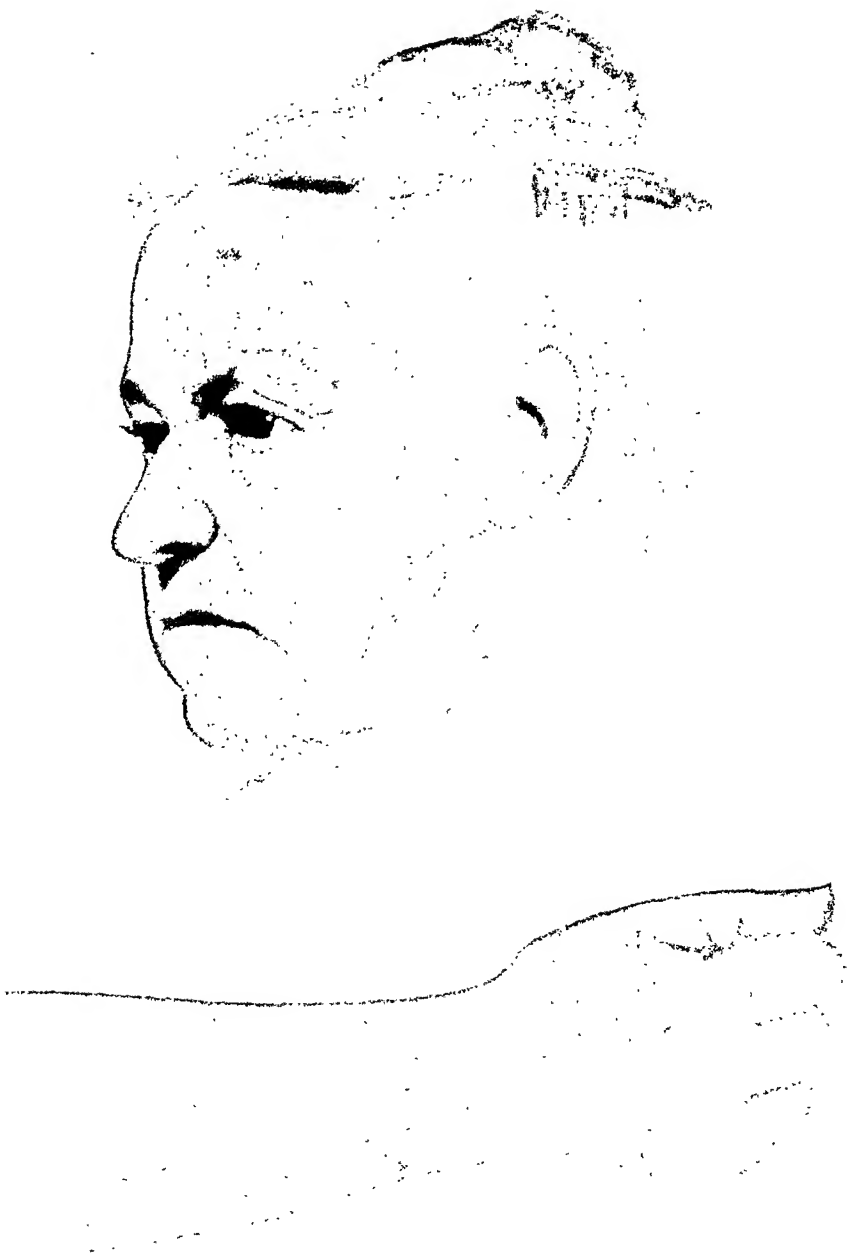
beneficent use of the rays far outranks the exceptional catastrophe in which a disastrous result is produced. Dr. Ormsby has noticed that patients who burn in sunlight are burned by *x*-rays, and those who "tan" in sunlight "tan" under the rays.

The favorable and unfavorable effects of the play of radium and of the other rays enumerated above have not been investigated to the point where the exact nature of the results produced can be determined; but none can doubt that in extreme dosage each is capable of stimulating the epithelial cells to any attainable limit. Each is a modified mode of motion; all are probably interconvertible; the rays in one case are direct and uniform in rhythm, in another they are intermittent in rhythm, and are shorter and longer in length; in yet another they fall transversely rather than directly upon the surface which is subjected to them. They all produce reactive effects; each may be responsible for irreparable damage, localized or generalized; and each may be employed with enormous benefit in the removal of the morbid growths which each is capable of engendering in the skin. From what precedes it is clear that the beneficial effects of all these rays occur when the stimulation of the epithelium is pushed to the point of cell shrinkage. When the process is carried away from the safety line of shrinkage of the cell nucleus and protoplasm to that where there is hyperkeratosis and excursion of epithelium beyond its normal limits, cancer results.

An interesting control experiment along parallel lines has been conducted (for the most part unwittingly) by physicians employing arsenic internally with various ends in view. The metal, as is well known, stimulates epithelial cells to an unusual activity. The classical erythema stage may follow and this be succeeded by symmetrical, extensive, diffuse, and often dense pigmentation. After this in certain cases on record hyperkeratosis and later perfectly typical cancer of the skin have resulted from the arsenical dosage, as noted by Hartzell and others. This fact is coupled with another, equally well substantiated, that arsenic both by injection and internal administration, as reported by Lassar, has been capable of removing both cancerous and other growths.

An extensive literature has accumulated on the subject of the physical and biological action of all light rays upon both plants and animals, which need not here be summarized. Cleaves has collated the results of experiments made by the most acute investigators in this field. In the main their conclusions agree. Intense ultraviolet frequencies are shown to have a vast influence, not merely in the production of the more or less salutary pigmentations already described, but also in producing changes in the vascular system and stimulation of both unstriped muscular fibres and of the processes of metabolism. In the pages which follow the attempt is made to note the influence of the actinic ray chiefly from the point of view of the clinician and the statistician.

PLATE II.



Pigmentation, Keratosis, Atrophic Patches, and Pigmenting Cancer of the Face and Exposed Parts of the Hands and Forearms of a Woman, sixty-four years of age.

In the senile condition of the skin, as is well known, its prickle cells atrophy and almost *pari passu* pigment accumulates in and about the cells of the basal layer. It is unnecessary in this connection to enter upon the question of the origin of this pigment, whether it be directly or remotely derived from the hematin of the blood or from changes peculiar to the cell itself. It will suffice to note that excess of pigmentation may be observed in cases where there has been no exodus of erythrocytes from the vascular channels and no degeneration of any outwandered organisms. In view of these changes, whether they be atrophic or degenerative in character, occurring at advanced periods in the life of certain individuals of the human family, the pigmentary deposits are doubtless due to an effort to protect the integument from the chemical rays to which the subject of such pigmentation has become extraordinarily sensitive. All the other phenomena of old age of the skin lend color to such a probability. It is when the hair is bleaching and the hue of the face is beginning to assume the characteristic pallor which betokens the ebb rather than the flood of the blood tide of earlier life, that pigment patches multiply and what has been well termed the precancerous stage is reached. Plate II. represents the portrait in oil of a woman aged sixty-four years, whose skin shows the first tokens of an hyperkeratosis that is producing an epithelioma in a single patch on the left temple. The integument of the face and of the exposed hands and wrists is thickly sprinkled with discrete brownish maculations, more than one of which, if a more advanced age be attained, will doubtless become cancerous. In youth her skin was fair and her eyes of a light hazel hue. Later in life she worked for nearly a year in the open fields. At her present age the hair is nearly white and the skin of the covered portions of her body still delicate.

This case is selected for illustration for the precise reason that it is not rare but indeed common. Every clinician of large experience has been made familiar with these lesions in the skin of the faces, of the hands, and of the exposed portions of the arms of men and women of the age when these symptoms are ordinarily first developed. All epitheliomata in the skin of men and women of advanced years are not accompanied by these pigmentations; but all pigmentations of this character at these ages and with this distribution are portentous of oncoming cancer of the skin.

Objection may be made to the conclusions that naturally follow the facts here set forth on the ground that no distinction is here recognized between the several forms of cancer of the skin which under the microscope reveal such striking differences in their mode of structural development and completed architecture. Thus it has been shown that in xeroderma pigmentosum there is a distinct invasion of the connective tissue, the epithelial advance proceeding from the basal layer of the rete; while in the so-called "sailor's

cancer," as originally shown by Unna, and more lately by Dalous and Constantin, the growth is a fungating epithelioma of the rete spreading chiefly to the horny layer, though also attacking the connective tissue. Similar objection might be based upon the histological differences recognized between the types of epithelioma of the skin much more frequently observed. In the attempt, however, to find a common cause for the entire group of cutaneous cancers, the important process is not one of hyperkeratosis or parakeratosis, not the occurrence of mitoses nor of exaggeration of perinuclear cavities, not that the epithelial invasion be upward toward the horny layer or downward to the corium, not that the advance is by column or by nest-formation, the essential fact in all is solely and simply that the epithelium is stimulated by the inconceivably rapid velocities of the actinic rays to a proliferation beyond its physiological limits.

All the apparently capricious modes of evolution of the cancerous process are without question subject to one law and pushed by a similar impulse. This was strikingly illustrated in the case of a male patient recently under observation suffering from multiple cancer of the face. One lesion was a typically developed papillomatous growth as large as an English walnut, projected boldly from the cheek; there were besides a score of superficial scaling and flattened epitheliomata over the nose and forehead, which, as in the case of so many of similar type, promptly disappeared under treatment by radiotherapy. But in front of the right ear was a deeply situated growth of malignant type accompanied by cervical adenopathy which recurred with eventually fatal consequences after surgical extirpation.

Some light is thrown on the important questions here raised in the volumes of the Census Reports of the United States for the year 1900, concerned with Vital Statistics, published in the city of Washington in the year 1902. Vol. I. gives the General Analyses and Ratio Tables; Vol. II. the Statistics of Deaths. Those who are not familiar with the details of this great work should know that the data were obtained partly through efforts of the census enumerators and in part from the Registration Records of various cities and States of the Union. The former were the fruit of inquiries made directly from representatives of families; the latter were the results of local registration. In some districts these last were accepted as excellent; in others they were found defective and were corrected in part by suggestions from the census officers; yet others were incomplete and unsatisfactory. The results, as a whole, are of great value.

The aggregate population of the United States in the year 1900 is set down as 75,994,575. Of this number 9,312,585 were colored. In this class 8,840,789 were negroes, the remainder were Chinese, Japanese, and Indians. For the present purpose it will suffice if the entire population classed as colored be assumed to have skins more or less protected by diffuse symmetrical pigmentation.

The total number of deaths reported from cancer in the United States during the census year was 29,475, among which 11,436 were males and 18,039 females. The proportion of cancerous fatality in 1000 deaths was 29.5. Ten years before the corresponding ratio was 22.5.

It is well known that the preponderance of deaths from cancer among women, as contrasted with men, is due to the percentage of cases of cancer of the breast and uterus in the former sex. It will be seen from what follows that when these cancerous cases are excluded from the list the percentage, as might be anticipated, is considerably greater in men.

The deaths reported as due to cancer of the head, face, and neck, in connection with the subject under discussion, are of special interest. While it is not definitely stated that these were all cases of cancer of the skin, clinical evidence establishes the fact that the majority of all cases of cancer of these regions originates in and is chiefly limited to the skin and underlying parts.

The total number of deaths from cancer of the head, face, and neck set down in the Registration Record for the census year was 791, of which 531 were in males and 260 in females—an enormous difference in favor of women, and one pointing certainly to protection secured in large proportion by persons of that sex in consequence of their in-door life and occupation. The death rate was 3.7 higher in males than in females (1.8), and was highest in persons of sixty-five years of age and over, males 386, females 335. Ten only of these cases occurred in persons under twenty years of age; 84 in those between twenty and forty-four; 305 in persons from forty-five to sixty-four, and 388 in persons sixty-five years of age and over. It is to be remembered in dealing with these figures that they include only fatal instances of the disease. They do not indicate the age incidence of cancer of the skin. Many persons dying at sixty-five years of age and over of cancer of the head, face, or neck had incurred the disease at an earlier period of life. Classical epitheliomata of the face have remained for nearly fifty years practically unchanged. The early diagnosis in these cases was made by such distinguished surgeons as the elder Gross and Mott.

A large proportion of the deaths from cancer of all organs in male subjects during the census year occurred among those given to out-of-door occupations. These are tabulated as persons engaged in agriculture, boatmen, canalmen, draymen, hackmen, teamsters, farmers, planters, farm laborers, gardeners, florists, nurserymen, vinegrowers, lumbermen, raftsmen, stock raisers, herders, drovers, sailors, pilots, fishermen, and steam railway employés. These occupations furnish about 10,000 cases. It is needless to add that these figures are concerned chiefly with the disease in the male sex, those relating to the formidable number of deaths from cancer of the uterus and breast in women are practically excluded.

Comparing these classes of laborers one with another none suffers as does the agricultural toiler, who furnishes more than nine-tenths of the cancer mortality in this class. It should be stated, however, that in this country those who are engaged in agricultural pursuits outnumber by about one-fifth all the other representatives of labor in the country.

Respecting the reason for the conspicuous disparity in the deaths from cancer between the out-door class and others, as shown later, apart from the numerical preponderance of the former, explanation heretofore has been chiefly based upon the excessive exposure of the farm laborer to the vicissitudes of the weather. This term has been supposed to designate the effect of cold and heat, and the impact of snow, hail, and mist upon the exposed parts of the body. But even a superficial examination of facts points to the conclusion that neither heat, cold, nor storm effects are responsible for the production of cancer of the skin in the exposed faces, arms, and hands. The farmer, for example, works out-of-doors chiefly in the summer, where he is greatly exposed to the action of sunlight; while during the winter the toilers, at least on the American farm, are often comfortably housed and exposed to the blasts of winter much less than men of other occupations. After his crops are harvested the life of the farmer is often pre-eminently that of the indoor class. Along the steppes of Siberia and elsewhere the Russian farmer during the winter season is in a state akin to that of hibernating animals, interrupting his monotonous life by his sparse eating and by his excessive drinking of vodka. The motormen of large cities, the wheelsmen of vessels, policemen, locomotive engineers and the like have their faces exposed to the weather both in winter and summer far more than the farm laborer, while the latter, unprotected by a cabin or by the roof of a car during the summer season, is in his working hours bathed in the sunlight illuminating the open spaces in which he works, wholly unprotected by neighboring buildings, by roofs, or by cover of any kind.

They who toil in atmospheres of intense cold largely escape the dangers of cancer of the integument. The disease is almost unknown in Iceland, the Faroe Islands, and Greenland. In studying, however, the geographical distribution of cancer, caution is needed. Hirsch and the few other writers who have discussed this subject agree that in countries where careful registration is not practised, the statistics are, for the most part, scanty and untrustworthy.

As to the effect of extreme cold upon the skin, it is well known that in the Alpine regions what is called "the cold burn of the face" is due to exposure to ultraviolet rays and not to frost. The vivid reactions to the Finsen light as it passes through its water-cooled lens, from which all heat rays are excluded, is a familiar illustration of this fact. Cancerous growths are said to be extremely rare among the Eskimos. To what extent their immunity may be

due to the fact that among them the skin is never washed but constantly protected by a layer of walrus grease, would be difficult to determine.

That heat rays are not responsible for the preponderance of cancer of the skin among those exposed in out-of-door occupations is suggested by the immunity reported among the inhabitants of Arabia, Syria, Egypt, and North and South Africa. Tunis is reported by Rebotel and Tiriant as a place where there is "absolute absence of cancer." It is rare in Algiers. The negresses of Senegambia are said to suffer very rarely from uterine cancer. If these be indeed countries where cutaneous carcinosis is among the rarest of disorders, the most natural explanation of the fact is found in the protection furnished by the colored skins of the larger part of these inhabitants.

The disastrous effects of heat in those whose skins are directly exposed to its rays are well known and need not be enumerated; cancer is not cited among them. Stokers, sugar-bakers, workers in blast furnaces, glassblowers, and stationary engineers are not shown to suffer from cancer of the skin more than the men of other occupations. They are subject to a series of inflammatory affections of the integument, all of which have been duly classified. In some cases their digits have been removed by a process of dry mummification, as in the instance of a stoker whose case was reported by Morison. It would seem that exposure to light, and possibly to light exclusively, is the special stimulant provoking a certain proportion of skins to the metamorphosis that means carcinoma.

Law, after nearly a quarter of a century's experience in a town where cancer of the skin was not uncommon, saw but two miners who were thus affected, and these were men who had long ceased to work in the subterranean darkness. He attributed, however, the immunity to the tea-drinking habits of this class of laborers.

A comparison of the percentage of deaths from cancer in the rural and urban populations of the United States is of interest in this connection, seeing that the residents of cities are far less exposed both in summer and winter to the direct rays of the sun than are those living in the country. An objection to the value of such figures lies in the fact that to a large extent the metropolitan centres in every State for persons suffering from serious cancerous disease are places of resort by reason of the opportunities there afforded for securing superior professional skill and hospital accommodations. None the less the following figures furnish proof of the fact that the urban suffers less from cancer than does the rural population.

Selecting the registration area for such a comparison, an area chiefly made up of Northern States, the proportion in 100,000 deaths of the white population from cancer and tumor for the year 1900, was in the rural districts of registration States 71.4; in cities

in registration States, 63. Among the whites the percentage was 66.7; among the colored, 47.7. It was much higher in the native whites of native parents (66.9) than in those of foreign parentage (25.7). In comparison with the statistics of the preceding ten years the increase in the death rate due to cancer and tumor range from 15 per cent. in the cities to 27 per cent. in the rural districts.

It has been already pointed out that a pigmented condition of the rete furnishes in greater or less measure immunity against the actinic rays. The law seems to be that this immunity is proportioned to the diffuseness and uniformity of the staining, and that the danger point is reached, in what is fortunately a minority of all skins, when the epithelia are stimulated to furnish this immunity in a much less diffuse and uniform measure.

Turning again to the census reports, the registration in the United States for the census year includes, as has been shown, 29,475 deaths from cancer, inclusive of 11,436 males and 18,039 females. In order to eliminate cases of cancer of the uterus and the breast from the conclusions drawn, the male colored subjects of cancer may be considered apart from others. Collecting the figures represented in the United States, the registration area, the registration cities, the cities in registration States, the rural portion of registration States, the registration cities in other States, and the non-registration records, it appears that 1076 colored males died of cancer during the year 1900. The percentage, therefore, in the colored population, amounting to 4,710,235 of colored males, of those dying from cancer is 0.000228.

An interesting contrast is apparent when selecting two States of the country, one northern in situation, the other southern, having nearly the same population, and comparing the cancer statistics of the two. Mississippi, for example, has a population of 1,551,270, constituted of 907,630 negroes and only 643,640 whites. During the census year but 84 males are reported dead of cancer in that State. By way of contrast the State of Minnesota has a population but slightly larger, namely, 1,751,394, yet in the census year 320 males are reported dead of cancer, nearly four times as many as in the Southern area. None the less, the State of Mississippi recorded 200 more fatal cases of consumption than did Minnesota.

Again, the State of Georgia has a population of 2,216,331, of whom 1,034,513 are negroes. During the census year only 92 males of that State were reported as dead of cancer. The State of Iowa, in comparison, with a population slightly larger, namely, 2,231,853, than that of Georgia, reported during the census year 375 deaths from cancer of male subjects, more than four times that of the sister State, with 946 fewer deaths from consumption. It is reasonably clear that the inhabitants of the two Northern States named were better housed, better fed, and better clothed than were the others. The difference is partly explicable on the

ground of the immunity furnished by the dark skin of the negroes in Georgia, numbering 1,034,813, living side by side with 1,181,518 of whites.

It may, however, be doubted whether the native white population of the Southern States is as susceptible to actinic rays of light as their white neighbors of the North, seeing that many of the country districts of the Gulf region are populated by white natives who have acquired a relative degree of immunity by the deepening of the color of their skins under the influence of solar light. It is a familiar experience in our Northern cities to recognize these travellers from the Southland by the diffuse and symmetrical staining of the integument produced by habitual exposure to sunlight. It would seem that it is the Northern farmer and farm laborer whose skins lose their protective "tan" during the prolonged winter season and who suffer from the daily sun bath during the summer's toil in the open fields.

Turning to the figures representing the fatality from cancer of the head, face, and neck (practically that of the skin), in the four States selected for comparison, the two sexes may be studied together. In the State of Mississippi 27 persons of both sexes died during the census year of cancer of the head, face, and neck; and besides these 94 deaths from cancer were reported as "not specified." In the State of Minnesota during the same period there were 39 deaths from cancer of the head, face, and neck, and 138 "not specified." In the State of Georgia there were for the same period 25 deaths from cancer of the head, face, and neck, and 130 "not specified." In the Northern State of slightly larger population, Iowa, there were 53 deaths from cancer of the head, face, and neck, and 212 "not specified." In brief, the two Northern States lack but 10 of reporting double the number of cases of cancer which proved fatal in the Southern States. These figures are the more remarkable when it is considered that about one-half of the population of each of the two Southern States contrasted were whites.

Selecting, finally, still larger groups of population with a view to comparison, the North Central Division of the States of the Union, arbitrarily established by the census, includes the States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas. This area was populated in 1900 by 26,333,004 people. The colored population amounted to 557,134.

The South Central Division was made to include the States of Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Texas, Indian Territory, Oklahoma, and Arkansas. The inhabitants numbered 14,080,047; the colored population was 4,264,135. The percentage of cases of deaths from cancer of all kinds reported from the Northern group was larger than that of the States in the Southern group. From what may be termed a control observation,

as showing that no presumed general salubrity of the South Central Division could have been responsible for this difference, it appears that the percentage of deaths from "consumption" in the Southern division was larger than in the Northern area. An additional emphasis attaches to these figures because of the fact that over half a million of colored people inhabited the Northern and more than ten millions of whites the Southern district.

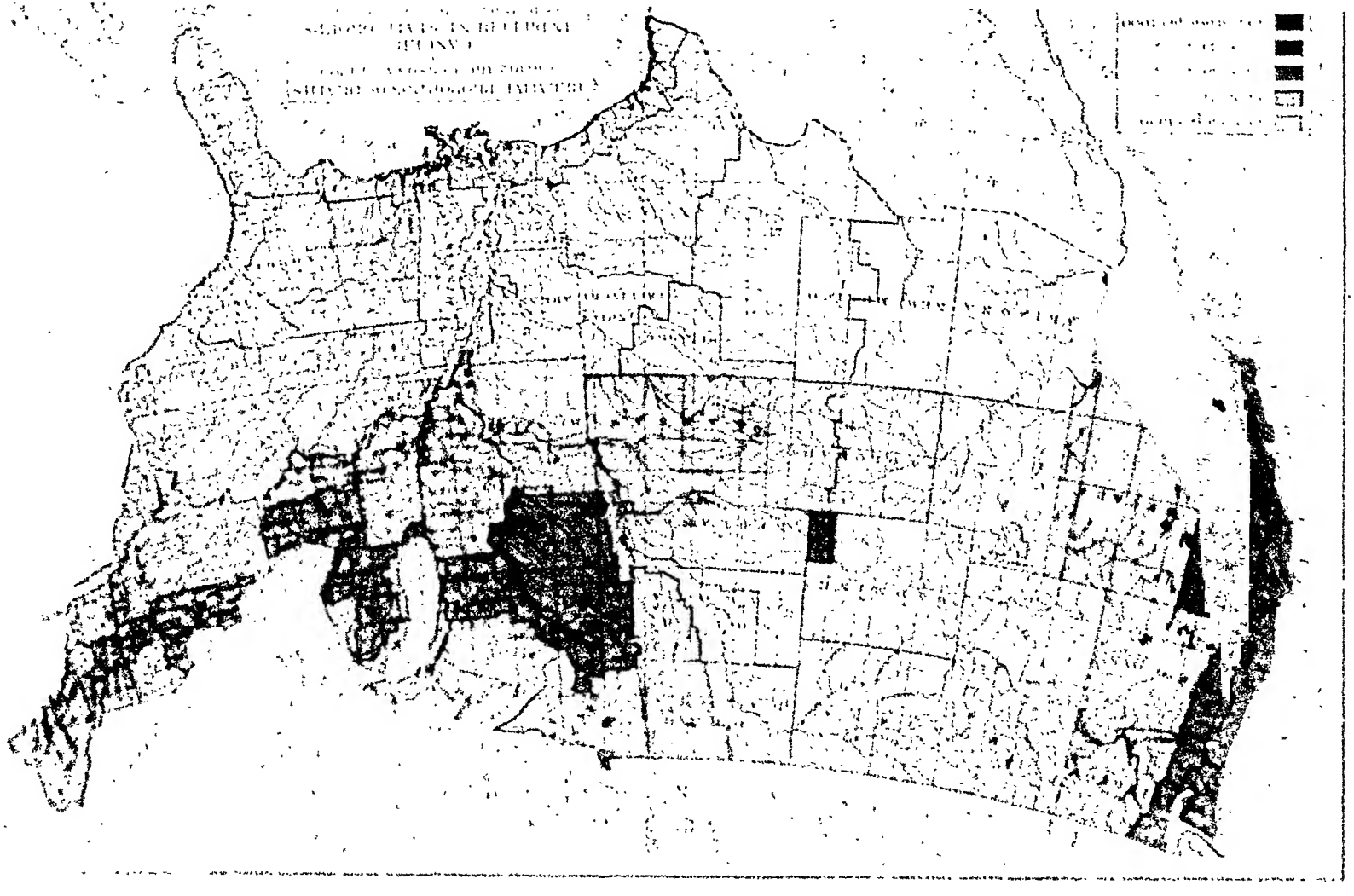
The accompanying map, published in Vol. III. of the *Reports of the Twelfth Census of the United States*, shows the relative proportion of deaths from cancer in the several State groups per one thousand deaths from known causes.[1] The intenser shades are seen in the Eastern, Central, and Western North; while the lighter shades indicate by a striking difference in color the relative freedom from cancer in the Southern districts. The analyses of the government bureau demonstrate that the proportion of deaths due to cancer was greatest in the Pacific region, the northeastern hills and plateaus, the prairie region, and the heavily timbered region of the Northwest.

The proportion was least in the South Mississippi River belt, the Southeastern Central region, and the Southern interior plateau. A very strong presumption is thus raised in favor of the belief that the small ratio in the Southern group of States is due to the millions of colored people inhabiting that region who enjoy protection against the injurious influence of the chemical rays in consequence of their dark skins.

As if to furnish a conspicuous exception to prove the rule, it will be noticed on inspection of the map that the State of Alabama is there represented with a color that in its depth distinguishes it from its neighbors in the South. The Census Statistics explain the exception. Alabama has a population greater by somewhat more than 275,000 than its Western neighbor, Mississippi, and less by more than 380,000 than Georgia, which immediately joins it to the East. Now, while the colored population of Mississippi outnumbers the whites by more than 265,000, and the colored population of Georgia lacks less than 150,000 of equalling the whites, the colored population of Alabama is less by about 170,000 than that of the whites; by 82,000 than that of Mississippi, and by more than 200,000 than that of Georgia. The deaths from cancer in these three States include 89 more in Alabama than in Mississippi, the increase occurring in the white population; while the deaths in Georgia from the same cause, in a population 387,000 larger than Alabama, exceeded by 50 only the number in its neighboring State.

The deeper-tinted belt bordering the Gulf of Mexico to the westward is not visible on the Florida coast. The presumable explanation is that on the Florida coast, which is destitute of large seaports,

[1] The author desires to express his obligations to the Hon. S. N. D. North, Director of the Census, for permission to reproduce this map.



there are fewer invasions by the whites for the exchange of commodities; while the other States bordering on the gulf have numerous seaports spread from Mobile to Galveston, all of them attracting the presence of numbers of white people in the enterprises of trade and commerce.

If the evident degree of immunity against cancer enjoyed by the full-blooded African be not due to the color of his skin but the gift of some other physical endowment, no evidence has been presented to establish such a fact. The special liability of the blacks to tuberculosis is well substantiated. The proportion of deaths from "consumption" in the United States among the colored people to that occurring in the white population is as three to one. The negro, further, dies as the result of attacks of the exanthemata, from which the white man rallies with comparative ease.

In studying the difference between epitheliomatosis and affections of a different nature, an important distinction between them should be kept constantly in view. So far as is known all human subjects not enjoying immunity, secured either by the artifices of science or by a previous attack, can be infected with tuberculosis, syphilis, glanders, anthrax, and other transmissible disorders. This is apparently not true of cancerosis. So far as can be determined at the present time the majority of all human beings are wholly incapable of developing the symptoms of the disorder; and as respects the minority these are susceptible chiefly at a certain period of life. Enormous groups of men, women, and children endure traumatism and local infection, live to old age, and perish without manifesting either the lesions of cancer or any tendency to them. Among the minority who have reached the age when such accidents are possible, the skin, which is the seat of trifling traumatisms, and even when not subjected to accidents of any sort, may suffer from the invasion not of one epithelioma merely, but even of several. The study of cancer should surely begin with investigation of the special conditions which make the cancerous change possible in a fairly defined group of susceptible individuals. The assumption that cancer may succeed primary accidents in any person whatever is manifestly erroneous.

If it can be shown that the susceptibility to cancer in a certain percentage of human beings is related to an acquired or inherited inability of the skin to withstand the waves of high frequency in the spectrum, the objection will be urged that in the cancer tables the skin stands fifth or sixth in the rank of organs most often attacked, the stomach usually heading the list. The order of frequency in the American tables is practically echoed by those submitted from Great Britain, Canada, India, and Australia. After the stomach in order are named: the uterus, liver, breast, abdomen, head, face, and neck (as thus grouped), the mouth, the tongue and throat, the genitals, the rectum, the bladder, the kidneys, the ovaries,

the lungs, the larynx, the lower extremities, the brain, the upper extremities, the penis, the eye, and lastly the testicles. It is interesting to note that during the census year no negro died of cancer of either the penis or of the eye. The ductless glands are not named in the list.

Some reserve is needed in accepting the statements made to census enumerators respecting the facts collected. A proportion of cancers set down as involving the breast may be reasonably assumed to be instances of Paget's disease, where the nipple or areola was first involved. "Cancer of the abdomen" is a misleading term; and it is to be regretted that it was accepted by the Census Bureau. The relative frequency of involvement of the lower as contrasted with the upper extremities is possibly explicable on the basis of the exposure of the feet and ankles in agricultural laborers.

If it can be shown that the skin resents bombardment with actinic rays by first seeking an insufficient protection behind its pigment, and later by undergoing hyperkeratosis and a cancerous change, what reason can be urged in favor of any such cause in the case of cancer of the viscera of the body, which are encased for the most part in light-proof envelopes?

The question, though not strictly pertinent to a discussion of this part of the general subject, deserves attention. Evidence is not wanting in favor of the fact that the colored races suffer less than the whites from cancer of other organs than the skin, evidence incidentally set forth in the figures which precede. The deaths, for example, of colored females in the year 1900 from cancer at all ages and of every organ was less (7.9) than in white females (9.1). Before the age incidence of cancer is reached among the whites, colored women show a slightly higher percentage, due doubtless among them to the earlier age at which marriage and childbearing occur.

If, as it would appear, the colored races enjoy a certain degree of immunity from cancer of the skin, it is possible that in a larger proportion of cases than has been thus far demonstrated there is a surface "invasion-atrium" in cancerous cases, from which, in a large measure, they escape. It is also possible that the metabolites of epithelial protoplasm in the rete may be effective in the transfer of that immunity to other organs provided with epithelium. Some of the complexly constituted leukomaïns, represented by no fewer than twenty-six members of the purin, hexon, and pyrimidin groups, may thus become effective in the colored races. In the cutaneous disorder designated acanthosis nigricans, visceral epitheliomatosis has been noted by Grosz. It would be commonplace to add in this connection that the skin of every animal bears the closest relation to every other organ of the body, and the mutual dependence of all is to be recognized in every morbid process. I am indebted to Professor Hektoen for the statement that black rats are

more resistant than gray, and gray rats than white, to anthrax. In this connection also it is interesting to note that Gaylord and his colleagues in studying Jensen's adenocarcinoma obtained their remarkable results after experimentation with white mice only.

Respecting the percentage of the whites, unprovided with the protective pigmentation of the skin accorded the colored race, and hypersensitive to the play of actinic rays, the prophylaxis suggested, did the methods of science not intervene, would relegate them to the habits of the prehistoric inhabitants of our planet. If nearly 5 per cent. of all, representing this unprotected class, could be furnished some such artificial envelope as that supplied by the red paint of the American Indian, and a dwelling scarcely better lighted than the caves of the stone age, cancerosis might share the banishment which to-day threatens tuberculosis of the human family.

The doctrine that light is capable of exciting in animal tissue a series of changes which may terminate fatally is not inconsistent with the facts of science. Beneficent as they are shown to be in much that relates to both the genesis and conservation of life, heat, light, and electricity, interchangeable modes of motion have each a stroke wherewith slowly or swiftly they may destroy that life. Each of them obeys the higher law which ordains that the ultimate elements of the body, temporarily assigned to the uses of one organism, must eventually rearrange themselves for the purposes of another, whether that other be higher or lower in the scale. The throb of each takes part in the propulsion of the shuttle that flies without interruption between life and death.

Conclusions. 1. The skin of the human body, in a certain proportion of individuals, and in those only, is hypersensitive to the action of the actinic rays of the spectrum.

2. This hypersensitiveness may be exhibited in the production of either hyperæmia, pigmentation, telangiectasis, atrophy, hyperkeratosis, or cancerosis of the skin; or by all, at times in a determined order of succession.

3. In the form of childhood cancerosis known as xeroderma pigmentosum, the pigmentation, telangiectasis, atrophy, hyperkeratosis, and cancerosis of the skin resulting from exposure to rays of light are exhibited early in life, instances of this disorder being exceedingly rare.

4. Pigmentation, telangiectasis, atrophy, hyperkeratosis, and cancerosis of the skin occur in adults much more frequently than in childhood, reaction to the play of actinic rays of light upon the surface being chiefly determined after the middle periods of life have been reached.

5. Physiological pigmentation of the skin in the colored races seems to furnish relative immunity against cancerosis of that organ.

6. The colored races apparently suffer less than the whites from cancer of other organs than the skin. This relative immunity may be due to the protection from actinic rays of light furnished by the pigment of the integument.

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A NEW METHOD OF OPERATING ON DUPUYTREN'S CONTRACTION OF THE PALMAR FASCIA,

TOGETHER WITH THE SUCCESSFUL USE OF NEURAL INFILTRATION IN SUCH OPERATIONS.[1]

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In *American Medicine* for October 31, 1903, p. 704, appears a brief paper read before this body two years ago, illustrating the successful use of neural infiltration of the median and ulnar nerves during an operation for Dupuytren's contraction of the fingers of the left hand. The patient was a woman then sixty-two years of age, whose general health was very poor and who also had a very troublesome chronic bronchitis and a very distinct cardiac murmur, and was exceedingly nervous about her heart and lungs. Hence, I used neural infiltration instead of general anæsthesia. The operation that I did for the Dupuytren contraction on her left hand was the one I have ordinarily done—namely, incision in the line of the pronounced bands and the removal by dissection of the contracting bands in the palmar fascia. October 16, 1905, two years and a half after this operation, I saw her again. The following notes illustrate her condition and the new operation that I was obliged to devise.

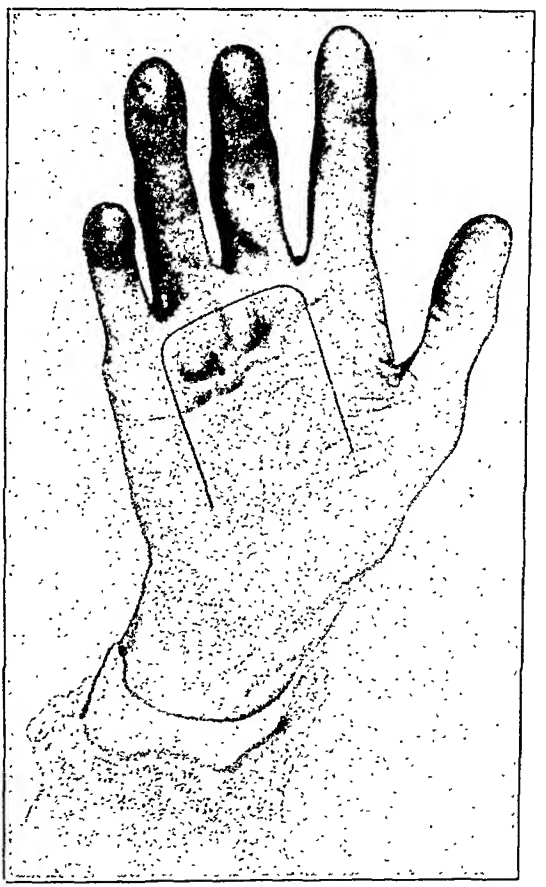
For some months past there have been appearing nodules and depressions in the skin of the right palm corresponding to a triangle with its apex at a point in the middle line of the hand just above a line drawn transversely to the web of the thumb, the base of the triangle being a line drawn between the margins of the forefinger and little fingers at the level of the knuckles (see illustration). There was evidently beginning contraction of the fascia and there would soon be contraction of all of the four fingers to a greater or lest extent. The nodules and pits were so diffused over the palm that is seemed to me impossible by incision in the axis where later the bands of contraction would develop satisfactorily to remove the contracting tissue. Moreover, the operation that I had already done upon the left hand, in which I had dissected out these bands, had been followed by a recurrence of the disease, so that the fingers of the left hand were contracted almost as badly as before the first operation.

Accordingly I decided upon operation after a new plan. I first infiltrated the skin just above the wrist over the median and the ulnar nerves with solution of beta-eucaine and adrenalin, of which the following is the formula:

Sol. adrenalin chloride	10 c.c.
Beta-eucaine	2 grams.
Sodii chloride	8 "
Aquæ destill. . . . . q. s. ad	200 c.c.

[1] Read before the College of Physicians of Philadelphia, November 1, 1905.

Having exposed these two nerves, I then injected a few drops of this same solution into the two nerves. After waiting for a considerable time I attempted to begin the operation, but found that it was exceedingly painful. Scarcely any diminution of sensation had been produced by the infiltration, although the injection at the site of the operations on the two nerves had been entirely satisfactory. I then injected into each nerve 4 or 5 drops of a 4 per cent. solution of cocaine, and within three minutes was able to



Early stage of Dupuytren's contraction of the palmar fascia. Note the nodules and puckered depressions. The line indicates the flap which included the palmar fascia.

begin the operation without the slightest pain. In consequence of the very careful dissection in the palm, the operation lasted over half an hour. The local anæsthesia at its end was quite as satisfactory as at the beginning.

Operation, October 19, 1905. I began the incision at the ball of the thumb on a line with the interspace between the forefinger and middle finger, went down almost to the web between the forefinger

and middle finger, then transversely to a point just above the web between the ring and little fingers, and up to the ball of the little finger at a point corresponding to the beginning of the incision on the other side of the hand (see the outline in the illustration). The dissection of the flap was begun at the transverse incision corresponding to the knuckles and went directly down to the sheaths of the tendons. I dissected back the entire flap, including on the under surface of the flap the entire palmar fascia. I then dissected away the palmar fascia from the under surface of the flap, the fingers of my assistant being on the palmar surface of the skin, so as to warn me if I got too close to the skin. At one point, in spite of this precaution, a small nick was made entirely through the skin. The whole of the flap turned back bled freely, of which I was very glad, as it showed the improbability of any sloughing.

In order to dissect out the fibres going to the index and the little fingers, I next undermined the skin overlying them, and was able readily to get at the beginning small bands of fibrous tissue which had not been turned back in the large flap. I tied half-a-dozen small vessels with catgut, so as to have as little danger from any effused blood as possible.

Union took place by first intention throughout both of the small operation wounds over the nerves and that in the palm of the hand. No sloughing whatever took place; even the little nick that I made inadvertently in the skin of the palm was rather advantageous, as it allowed what little blood was effused under the flap to escape. She was discharged from the hospital with almost normal motion of the fingers, and, undoubtedly, the use of the hand for a few days would entirely restore its function. She had no rise of temperature whatever after the operation.

Remarks. In this particular case the diffusion of the nodules all over the centre of the palm was such that the ordinary operation for dissecting out the contracting bands would have done no good. I therefore determined to remove the entire palmar fascia. To do this by dissecting up the skin alone would almost certainly have been followed by sloughing of the flap. By lifting a flap consisting of all the tissues of the palm down to the sheath of the tendons I was able to retain sufficient nourishment to the flap to prevent sloughing, and at the same time made the palmar fascia entirely accessible for removal. I was much pleased also to find that I could reach the parts going to the index and little fingers perfectly well by simply undermining the skin. Had it been necessary an incision could have been carried along the axis of any of the fingers and a more extensive dissection made.

I am inclined to think that this method of operating on the palmar fascia may be desirable in other more advanced cases where there are distinct bands already formed, and I propose trying it in the next case of this character.

THE SUCCESS WHICH AT THE PRESENT DAY ATTENDS THE OPERATION OF CATARACT EXTRACTION AND THE CAUSES THAT CONTRIBUTE TO IT.[1]

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Although statistics are proverbially misleading, and especially, it must be admitted, statistics relating to surgical procedures, there can be little question that appreciably better results are obtained at the present time from the operation of cataract extraction than were obtained twenty-five or thirty years ago, and much better results than were secured a half-century since, when flap extraction was in vogue, and the modified linear extraction of von Graefe had not yet been devised. During the first half of the last century the most skilful surgeons were well content if in a series of flap extractions their failures did not exceed 12 per cent. During the two decades following the introduction of von Graefe's operation there was a definite improvement in the results secured, though 8 to 10 per cent. of failures were not uncommon. At the present day the operator whose failures exceed 4 or 5 per cent. has little ground for self-gratulation.

In a compilation of the results of over two thousand cataract extractions by well-known ophthalmic surgeons of this country and Europe made by Dr. Frank M. Ring[2] in 1895, about half of the operations having been done with iridectomy and about half without, the percentage of failures was 3.67. In my own series of 100 consecutive cataract extractions, including twenty "simple extractions," which I reported in the *American Journal of Ophthalmology*, December, 1899, although the cases were by no means selected ones, there were but 2 in which the operation could be said to have been a failure; for, though there were 4 cases in which vision was not improved, the recovery from the operation was smooth in 2 of these, and the non-restoration of sight in each of these 2 was due to causes which antedated the removal of the cataract—in 1 to extensive detachment of the retina, and in 1 to atrophy of the retina consequent upon specific choroido-retinitis. In 92 cases operated upon since this report there have been 4 failures, 2 from suppuration—exactly the same as in the first series—and 2 from other causes, giving for the whole series of nearly 200 cases a percentage of failures of 3.12.

[1] A paper read before the Medical and Chirurgical Faculty of Maryland, April, 1905.

[2] Medical Record, February 23, 1895.

As to the causes which have contributed to this markedly better showing, as compared with the results obtained fifty years ago, they are not far to seek. The improvement in the method of operating for senile cataract which we owe to von Graefe is, perhaps, the most far-reaching of these; for, although his modified linear extraction is hardly ever performed nowadays exactly as he performed it, its introduction marked a new era in the surgery of cataract, and the widely practised "combined extraction" of the present day is the direct outcome of his procedure.

The discovery of the anæsthetic action of cocaine, made by Koller in 1884, deserves to rank next in importance. The application of the principles of antiseptic surgery to cataract operations, it might seem, should be reckoned of greater moment than the introduction of local anæsthesia; but I do not think this would be a correct estimate of the relative value of these two advances. Surgical cleanliness, unquestionably, contributes materially to the success of operations upon the eye; but its influence here is not so great as in many other branches of surgery. This is accounted for, in the first place, by the fact that absolute asepsis is practically impossible in ophthalmic operations, and, in the next place, by the circumstances that in eye surgery the incisions are comparatively small, the hands of the operator need not be brought in contact with the wound, the ocular tissues are very vascular, and furnish no dead spaces favorable to the development of bacteria, and the tears, themselves, are measurably bactericidal. On the other hand, it is difficult to overestimate the help that the ophthalmic surgeon derives from local anæsthesia, which, as is well known, finds its chiefest field of usefulness in operations upon the eye.

Among other causes which have to do with the present-day success in cataract operations may be mentioned the skilled nursing now at command, the improved hospital facilities, the provision against postoperative accidents afforded by such contrivances as the protective shield of the late Dr. Russell Murdoch, Ring's and Emerson's masks, etc., and, finally, the more definite specialization of eye surgery.

In view of these many factors tending to promote success in cataract extractions the pertinent question suggests itself, Why do we not obtain still better results? Why should there be a failure in every twenty or twenty-five operations for cataract? Why should there be, in addition to these failures, 6 or 7 per cent. of only partial successes—of cases in which vision less than one-tenth is secured? The answer is that, in spite of the most careful antiseptic precautions, about 2 per cent. of the eyes operated upon are lost by pyogenic infection; that a not inconsiderable proportion of cataractous eyes are unsound in other respects, and therefore not capable of withstanding the shock of operation as they otherwise would; that as cataract is peculiarly a disease of advanced life the subjects of it

are often not in the best condition for surgical procedures, 1 per cent. of them being glycosuric, 6 per cent. albuminuric, and a much larger proportion having atheromatous arteries; and, finally, that the temperament of the patient plays a not inconsiderable part in the outcome of every operation for cataract.

Only those who have had experience in ophthalmic surgery know how significant a factor this matter of the tractability or intractability of the patient is. The tractable patient is calm during the operation; does what he is told to do, and leaves undone what he is told not to do; directs his gaze upward or downward when so requested, and refrains from contracting his lids when warned that this is fraught with danger. In a word, he exercises self-control, and shows confidence in the skill and good intention of the operator. During the period of convalescence his behavior is equally irreproachable, and whatever the result of the operation, at all events, no blame can be laid at his door. Another patient, and our "fellow citizens of African descent" supply many striking examples of this type, is the exact antithesis of this. If, during the most delicate step of the operation, he is told to look down, he is sure to look up; if cautioned not to nip his lids, he forthwith proceeds to contract his orbicularis with all the energy he can command. If warned not to move his head, he can be depended upon to give it a sudden jerk, and at the most inopportune moment.

When, after much tribulation, the operation is finally completed, his shortcomings still continue to manifest themselves. He is bent upon getting out of bed without assistance, after having been strictly warned not to do so; he partly removes the dressings from the eye which has been operated upon to "try the sight;" and if told to open the eye for inspection or for the instillation of a drop of atropine, his levator palpebræ seems, on the instant, to become paralyzed, and he appears intent upon convincing you that his orbicularis has lost none of the energy which it displayed at the time of the operation. In a word *he*, from start to finish, does his level best, to use a slang phrase, to bring to naught the best efforts of the operator; and it goes without saying that he occasionally succeeds in doing this. Were those of his kidney eliminated, could they be—well, in some manner—sent to the "place prepared for them," and were our cataract patients always in sound health, and their eyes free from complicating diseases, then, indeed, would it be possible for the skilful operator to make very nearly a "clean score."

FEVER IN CHRONIC ENDOCARDITIS.

By John S. Thacher, M.D.,
of New York.

The mechanics or physics of cardiac valvular lesions have been very thoroughly studied and discussed, but, except in a certain group of cases which have been called malignant or ulcerative or infective, the other clinical features of the malady have been very generally neglected, though French[1] has written a most interesting article on the course of fever in certain cases of endocarditis. It is certainly forced and arbitrary, far from scientific, and hardly at all helpful—perhaps misleading—to divide cases of chronic valvular lesions into the two groups, the purely mechanic and the malignant. I have frequently been impressed in the wards of the hospital by cases of chronic endocarditis without evidence of complications, in which the fever has been a striking symptom, but in which the course of the disease could in no sense be called malignant. It may be suggested that these febrile cases without evidences of secondary lesions are infective, a suggestion which may represent the truth, but which in the present state of our bacteriological knowledge is largely theoretical and hardly helpful. In the hope of learning some facts as starting points for a partial clearing up of this subject, I have gone over the records of all the cases admitted to the Presbyterian Hospital between April, 1897, and March, 1905, which were put down as endocarditis either primary or secondary, including those called malignant endocarditis.

The total number of histories studied was 1093, or, viewing the different histories of a patient admitted more than once as making but a single history, 972. Of these 71 were discarded either because they were evidently fresh and first attacks (9 cases), or because the patient's stay in the hospital was so brief that the records were quite incomplete (41 cases), or because on reading the histories and records of autopsies the diagnosis seemed not to have been justified (21 cases).

This leaves 901 cases, which I have divided into five groups:

1. Those in which the temperature did not exceed 100°, 316 cases.
2. Those with a temperature exceeding 100°, and in which there were rheumatic articular symptoms, 131 cases.
3. Those with a temperature exceeding 100° and showing petechial or other hemorrhagic eruptions, 23 cases.
4. Those with a temperature exceeding 100° and presenting clear evidence of complications other than articular rheumatism or hemor-

[1] The Practitioner, 1904, vol. lxxiii. p. 753, The Temperature and Course of Infectious Endocarditis.

rhagic eruptions, complications which would readily explain the presence of fever, 207 cases.

5. Those with a temperature exceeding 100°, but without clear evidence of any complication sufficient to account for the elevation of temperature, 291 cases.

In these statistics patients admitted at different times have some of them been classed in more than one group.

In drawing these distinctions of temperature a rare or occasional passing of the limit was not considered.

1. In only 316 cases of the 901, that is about one-third, did the temperature remain below 100°. In these cases it is interesting to note that 168 (53 per cent.) gave distinct histories of previous attacks of rheumatism or chorea, and while in the hospital 28 (9 per cent.) had symptoms of articular rheumatism or chorea:

Mild rheumatism	14 cases.
Severe rheumatism	9 "
Chorea	5 "
	28 cases, 9 per cent.

There were also 4 cases showing petechial eruptions, and 1 with purpuric eruption.

It is interesting further to see that in many of these patients complications were observed either clinically or postmortem, which might have been expected to produce more elevation of temperature —viz.:

Acute pericarditis	3 cases.
Dry pleurisy	6 "
Pulmonary tuberculosis	3 "
Pulmonary tuberculosis (doubtful)	3 "
Infarction of the lung	2 "
Tonsillitis	1 "
Parotitis	1 "
Cholecystitis	1 "
Chronic colitis	1 "
Infarction of the spleen	1 "
Chronic gastritis and pancreatitis	1 "
Periurethral abscess	1 "
Femoral phlebitis	1 "
Ulcers of the legs	1 "
Hemiplegia	3 "

2. The patients who suffered with distinct symptoms of articular rheumatism while in the hospital, and whose temperatures ranged above 100°, were 131 in number, or 20 per cent. of the febrile cases. Of these 109 (17 per cent. of the febrile cases) showed no further complications. Compare this percentage with the 9 per cent. of afebrile cases which had symptoms of articular rheumatism. In a considerable proportion of these cases the rheumatic symptoms were slight and yet the fever was high, and one of the interesting facts elicited by this study is that patients with chronic endocarditis and with rheumatic symptoms in the joints may have a high degree

of fever. Acute articular rheumatism by itself may of course produce high fever, but I believe from the study of these cases that chronic endocarditis with articular rheumatism is apt to be associated with a considerably higher degree of fever than is rheumatism without endocarditis, and that this should be borne in mind in estimating the seriousness of cases of markedly febrile endocarditis with joint symptoms.

These rheumatic febrile cases have been divided into three groups according to the elevation of temperatures, the dividing lines being 101.5° and 103°.

In these 109 cases the fever was: (*a*) of the first degree (100.1° to 101.5°) in 42 cases; (*b*) of the second degree (101.6° to 103°) in 36 cases; (*c*) of the third degree (above 103°) in 39 cases.

In 4 additional cases there was chorea besides the rheumatism; 2 with fever of the first degree and 2 with fever of the third degree; and in 1 case there was chorea without rheumatism, the fever being of the third degree.

The remaining cases gave evidence of other complications besides rheumatism.

3. Those showing petechial or other hemorrhagic eruptions and whose temperatures rose beyond 100° were 23 in number. In 13 of the cases the eruption was called petechial, in 10 hemorrhagic. Blood cultures were made in 12 cases, with negative results in 8 cases; positive in 4.

The micro-organisms found in these 4 cases were in 1 case the pneumococcus, in 1 case the streptococcus pyogenes, and in 2 cases the staphylococcus pyogenes aureus. All of these 4 cases with positive cultures died in the hospital.

The range of temperature in these cases and the high mortality are shown in the following table:

TABLE I.

Summary.	*Cases.*	*Deaths.*
1. Maximum temperature 100°–101.5° barring an occasional rise	2	1
2. Maximum temperature 101.6°–103°	4	3
3. Maximum temperature 103° or more	17	15
Total febrile cases	23	19

Autopsies were made in 7 cases, all revealing an endocarditis of different degrees of severity (see Table III.); in 2 cases a focus of infection, in 1 a septic uterus, and in the other a pelvic abscess.

4. The fourth group, in which there were complications other than articular rheumatism or chorea and hemorrhagic eruptions, and probably sufficient in themselves to have caused the elevation of temperature, were 207 in number; 32 per cent. of the febrile cases; 23 per cent. of all the cases.

The most frequent complications were lobar pneumonia, acute pericarditis, acute pleurisy, cerebral embolism, thrombosis or

hemorrhage, pulmonary tuberculosis, acute tonsillitis, phlebitis, typhoid fever, colitis, and bronchopneumonia.

TABLE OF COMPLICATIONS IN THIS GROUP.

		Temperature.		
	Cases.	100.1°–101.5°	101.6°–103°	Over 103°
Rhinitis	1	...	...	1
Tonsillitis	12	2	6	4
Laryngitis	1	1		
Influenza	1	1		
Otitis media	3	1	1	1
Mastoiditis	1	...	...	1
Acute pleurisy	22	4	5	13
Empyema	3	...	2	1
Cancer of the pleura.	1	...	...	1
Lobar pneumonia	37	...	...	37
Bronchopneumonia	6	...	2	4
Pulmonary tuberculosis	13	5	2	6
Acute pericarditis	30	3	5	22
Gastroenteritis	1	...	...	1
Colitis	6	3	1	2
Hypertrophic cirrhosis of the liver	1	...	...	1
Cholecystitis	1	...	1	
Cancer of the peritoneum	1	...	1	
Purulent pyelitis	1	1		
Nephritis, acute exacerbations	4	3	...	1
Uremia	1	...	...	1
Abortion	2	1	...	1
Carcinoma uteri	1	...	...	1
Gonorrhea	2	...	...	2
Mastitis	1	1		
Meningitis	1	...	..	1
Tumor of the brain	1	...	...	1
Cerebral embolism, thrombosis, or hemorrhage	23	8	2	13
Delirium tremens	1	1		
Superficial ulcers and gangrene	6	3	...	3
Abscesses and cellulitis	10	2	2	6
Erysipelas	3	...	...	3
Phlebitis	9	3	2	4
Periostitis	1	...	...	1
Fracture	1	...	...	1
Typhoid fever	7	..	...	7
Malarial fever	6	...	...	6
Incision of the leg	1	...	...	1
Phlebotomy	3	1	...	2
Aspiration of the chest	6	...	4	2
Tapping abdomen	4	...	4	

These four operations at the end of the list are included because they were in each of these instances followed by a sharp and unexpected rise in temperature.

5. We now come to the cases in which there was an elevation of temperature beyond 100° without any marked complication to account for it. Such cases I find amount in number to 291. It occurred, then, in 32 per cent. of our cases. It is not to be assumed that this percentage would hold with all cases of chronic endocarditis outside of as well as within the hospitals, for undoubtedly those

who are feverish are, if other things are equal, more likely to come into the hospital than those who have no fever. Still, the large proportion of 32 per cent. is certainly striking.

In none of these cases were there symptoms of articular rheumatism during the patients' stay in the hospital.

I have divided them into three groups, as in the last series, according to the degree of fever, the dividing lines being 100°, 101.5°, and 103°.

Cases with fever above 100° without apparent cause: (*a*) 100.1° to 101.5°, 172 cases, 19 per cent. of all our cases; (*b*) 101.6° to 103°, 66 cases, 7 per cent. of all our cases; (*c*) above 103°, 53 cases, 6 per cent. of all our cases.

(*a*) These cases, 172 in number, gave no frank signs of major complications, but in a few instances there were suggestions of slight complications as follows:

Infarction of the lungs	12 cases.
Bronchopneumonia	2 "
Tuberculosis	7 "
Pleurisy	8 "
Pericarditis	1 "

In 1 of the cases cultures made from the blood developed pure growths of staphylococcus pyogenes aureus. There were slight indications of pleurisy in 1 case, but no other indication of complications.

In 15 cases of this group (V. A.) autopsies were made, and in 11 the autopsy as well as the clinical picture revealed nothing which would have been apt to produce fever unless simple passive congestion of the viscera can do so. In 4 cases, however, though the signs and symptoms during life suggested no complications, some were found postmortem as follows:

1. Acute colitis, acute pleurisy, and cerebral thrombosis.
2. Pleurisy with effusion.
3. Cholecystitis, portal thrombosis, and acute peritonitis.
4. Lobar pneumonia and acute pericarditis.

(*b*) The cases with fever reaching 101.5°–103° without apparent cause number 66.

(V. B.) Of these cases 8 came to autopsy. In only 1 of these was any lesion found outside of the heart likely to cause fever. In that case there was the appearance of a chronic dry pleurisy and a thrombosis of one vertebral artery.

(*c*) The last 53 cases with temperatures above 103°, as they are the most interesting, I have divided into three sub-groups:

1. Cases in which this high degree of fever was not long continued, 14 cases, 1½ per cent. of all our cases.

(V. C. 1.) In 5 of these autopsies were made, and in only 1 was any complication found which would be likely to raise the temperature. In that case there was an acute pericarditis.

TABLE II.

	I. Temperature not above 100°, 316 cases, 35 per ct. of total.		II. With fever and rheumatism, 131 cases, 14 per ct. of total.		III. With fever and petechial or hemorrhagic eruptions, 23 cases, 2.5 per ct. of total.		Cause of fever not explained. V. A. Max. temp. 100° to 101.5° barring occasional higher rise, 172 cases, 19 per ct. total.		V. B. Max. temp. 101.6° to 103° cause of fever not being clear, 66 cases, 7 per ct. total.		V. C.[2] Total.		V C. subdivided. Max. temp. of 103° or more, cause of fever not being clear, 53 cases, 6 per ct. total. 1[3]	2[4]	3[5]
	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Per ct.	Cases.	Cases.	Cases.
Previous history of rheumatism	168	53	98	75	16	69	88	51	34	54	...	...	14	16	23
Single attack or a few mild attacks	53	17	14	10	8	35	39	23	11	16	6	...	2	0	4
Repeated attacks or very severe attacks	75	24	60	45	5	21	36	21	15	22	16	...	5	6	5
Repeated severe attacks	20	6	20	15	3	13	11	6	6	8	4	...	2	2	0
Chorea	20	6	4	3	0	0	2	1	2	3	2	...	...	1	1
Total	168	53	98	75	16	69	88	51	34	54	28	...	9	9	10
While in hospital 28 (9 %) had symptoms of articular rheumatism or chorea	28	9	131	100											
Mild rheumatism	14	4 5	87	66											
Severe rheumatism	9	2.9	40	30											
Chorea	5	1.6	4	3											
Erythema multiforme	...	...	1	0.7											
Erythema nodosum	...	...	1	0.7											
Tonsillitis	...	...	1	0 7											
Total	28	9	134[1]	100											

Urine:															
Albumin less than 5%	136	43	53	38	14	60	82	47	32	48	24	...	9	5	10
Albumin 5% or more	50	16	12	9	5	21	56	32	17	25	19	...	4	7	8
Casts hyaline and granular	106	34	29	22	15	65	100	58	37	55	28	...	7	10	11
Casts hyaline and granular with other varieties or with blood	18	6	2	1	1	4	6	3.5	4	5					
No record of urinary examination	11	...	1	0.7	...	...	3								
Leukocytes:															
Less than 10,000	9	...	8	...	2	...	11	...	4	...	5	...	0	2	3
10,000 to 14,000	10	...	14	...	4	...	19	...	5	...	6	...	1	2	3
15,000 to 19,000	5	...	9	...	5	...	7	...	6	...	9	...	2	3	4
20,000 to 29,000	4	...	4	...	4	...	4	...	4	...	1	...	0	0	1
30,000 or more	2	...	1	...	0	...	...	...	1	...	3	...	0	2	1
Liver:															
Probably enlarged	23	7	9	6	2	9	23	13	6	8	4	...	2	0	2
Edge less than 2 inches below	24	8	6	4	2	9	17	9	6	8	5	...	1	1	3
More than two inches below border of ribs in the right mammillary line	45	11	4	3	5	21.8	47	27	23	34	13	...	5	6	2
Spleen:															
Probably enlarged	7	2.3	3	2	0	0	5	2.9	1	1	2	...	...	1	1
Clearly enlarged	9	2.8	6	4	6	26	15	8	6	9	5	...	1	...	4
Minor complications:															
Fluid in pleura	32	10	7	5	2	9	27	15	16	23	12	...	3	5	4
Signs of congestion	106	34	30	22	2	9	89	52	26	39	21	...	9	5	7
Blood-stained sputum	3	9	3	2	2	9	...	...	4	5					

[1] Three of these cases had two rheumatic complications.

[2] V. total, 291 cases, 32 per cent. of total.

[3] Fever not high long.

[4] Suggestion of slight complication.

[5] Above 103°. Prolonged high fever with no indication of complication.

TABLE III.

	Total cases.	Died in hospital.	Per cent.	Autopsies.	Known to have died after leaving.	Known to be still living.
I.	316	51	16	19	17	29
II.	131	16	12	7	4	23
III.	25	20	80	7	1	0
IV.	207	83	40	35	8	10
V.	291	117	40	36	19	23
V.a	172	60	34	15	14	20
V.b	66	27	40	8	2	2
V.c	53	30	56	13	3	1

TABLE IV.—The Valves at Autopsy.

	I.	II.a	II.b	II.c	Total II.	III.	IV.a	IV.b	IV.c	Total IV.	V.a	V.b	V.c	Total V.	Total.
Large vegetations with ulceration	2	...	...	3	3	2	...	...	1	1	1	...	2	3	11
Sclerosis with ulceration	3	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Large vegetations without ulceration	1	1	...	...	1	1	2	1	4	7	...	...	...	...	10
Small vegetations	1	...	...	...	...	2	...	..	...	...	1	...	1	2	5
Small vegetations with sclerosis	5	1	1	...	2	2	1	1	9	11	3	2	2	7	27
Marked sclerosis of valves	4	...	...	1	1	...	...	3	4	7	5	6	5	16	28
Slight sclerosis of valves	3	...	...	...	...	...	3	1	5	9	5	0	3	8	20
Total	19	2	1	4	7	7	6	6	23	35	15	8	13	36	104

I. Temperature not over 100°.
II. " over 100°, with joint symptoms.
III. " over 100°, with petechial or other hemorrhagic eruption.
IV. " over 100°, with complications explaining fever.
V. " over 100°, without complications explaining it.
a. " 100.1° to 101.5°.
b. " 101.6° to 103°.
c. " over 103°.

TABLE V.—Blood-culture Cases.

Groups.	Negative.			Positive.					
	Died.	Living.	Total.	Strept.	Staph.	Pneu.	Died.	Living.	Total.
I.	0	0	0	...	...	...	...	...	0
II.	6	11	17	...	...	.	...	...	17
III.	7	1	8	1	2	1	4	...	12
IV.	6	5	11	...	1	2	2	1[1]	14
V.	3	7	10	1	2	2	5	...	15
V.a	0	0	0	...	1	...	1		
V.b	0	4	4						
V.c	3	3	6	1	1	2	4		
Total	22	24	46	2	5	5	11	1	58

Four of these 58 "blood-culture" cases appear in two groups, and 1 case appears in three, reducing the actual total to 52.

[1] Discharged almost moribund. Staph.

2. Cases in which there was a suggestion of moderate complication, 16 cases, 2 per cent.; these suggestions pointed toward:

Possible consolidation in	4 cases.
Possible tuberculosis in	1 "
Infarction of the lung in	7 "
Pleurisy in	1 "
Acute bronchitis in	2 "
Infarction of the spleen in	1 "

In only 1 of these cases was there an autopsy. In this no complication was discovered postmortem beyond general passive congestion of the viscera and dropsy.

3. Lastly, cases in which this high temperature was prolonged without any symptoms or signs indicating complications, 23 cases, or $2\frac{1}{2}$ per cent. Autopsies were made on 7 of these, and in only 2 were there found complications likely to produce fever. In these 2 cases there were:

1. General miliary tuberculosis.
2. Acute meningitis.

The above figures show the frequency of fever in chronic endocarditis, the frequency of its various degrees, and its comparative frequency under certain conditions. Table II. shows the frequency of certain clinical features in some of the groups into which we have divided the cases. We can here see whether a rheumatic history, urinary changes, enlargement of the liver, etc., are more frequent in the afebrile cases, in the rheumatic febrile cases, or in the febrile cases without rheumatism or other complications.

Regarding the mortality among the patients of the different groups, the reports from those who left the hospital alive have been very incomplete, having been received from only about one-fourth of them, but I will give the statistics as far as they are available. (See Table III.)

We notice here that the highest immediate mortality is in the febrile cases with petechial or other hemorrhagic eruptions. Next, but far less fatal, are the febrile cases with important complications other than rheumatism, and the febrile cases without complications. Far the mildest, as regards mortality, are the afebrile cases and the febrile cases with rheumatic symptoms. It is surprising to see that the latter, the febrile rheumatic cases of chronic endocarditis, are less deadly than the afebrile cases. This may be due to the fact that the pains drive into the hospital patients whose hearts are not very much affected.

From Table IV. we can see that the clinical course of the fever is not always determined by the character of the endocardial lesion. Of the 21 cases in which autopsy discovered large vegetations, with or without ulceration, 4 did not go above 100°, and 4 others did not go above 101.5°. The 3 cases in which sclerosis with ulceration of

the valves was noted were all afebrile. Of the 36 uncomplicated febrile cases in which autopsies were made, only 3 had large vegetations (these 3 showing ulceration), 7 had small vegetations and sclerosis, 2 small vegetations alone, 16 marked sclerosis, and 8 slight sclerosis. Of the 13 autopsy cases with high fever, above 103° without complications, 2 had large vegetations with ulceration, 2 small vegetations with sclerosis, 1 small vegetations alone, 5 marked sclerosis, and 3 slight sclerosis, showing the much greater frequency of sclerosis than vegetative changes in cases with high fever.

Table V. shows the results of cultures from the blood.

The cases whose temperature curves follow, with very brief statements of the main features of the cases, will show the great variety to be met with in the course of fever in chronic endocarditis. In some it is an extreme intermittent fever (the septic type); in others it has long waves, it may be of a week or several weeks (typhoid type); in others it is fairly steady, and in others, again, extremely irregular. Instances will be seen where high and prolonged fever of whichever type is followed by improvement, occasionally by a long period of fair health.

From this review we see that:

1. A large proportion of hospital cases of chronic endocarditis, even when uncomplicated, have fever.

2. In many this fever is of high degree and long continued without apparent cause.

3. Neither the presence nor the degree of fever in these cases follows strictly the variety or degree of endocardial lesion.

4. The febrile cases with hemorrhagic eruptions are extremely fatal.

5. The febrile uncomplicated cases are about as fatal as the cases with marked complications and very much more fatal than the afebrile cases.

6. Nevertheless, some of these cases with high and prolonged fever get better.

7. The line marking off the group of malignant endocarditis is very uncertain.

8. The rheumatic febrile cases of chronic endocarditis are as favorable as the afebrile cases, or possibly more so.

Case I.—R. G., male, aged eighteen years. Never had rheumatism, but often tonsillitis. Dates heart symptoms from six years ago, when tonsils were removed. Dyspnœa and forcible heart action since then. In hospital five months. Long waves of typhoid-like fever from three weeks to a few days in length, and occasional isolated high shoots. Four loud murmurs. A little hypertrophy of the heart. No Widal reaction; six tests. Leukocytes, 13,000, 16,000. Blood cultures negative three times. No typhoid bacilli obtained from urine. Spleen never palpable. In good health since July, 1904; that is, for the last nine months; working fairly hard as

a cook. No symptoms except a little pain below apex of heart. The murmurs still distinct.

CASE II.—B. B., female, aged fifty years. History of considerable rheumatism. Heart symptoms twenty-two years. In hospital one month. Irregular intermittent temperature for two weeks, after that below 100°. Leukocytes below 7000, counted four times. No complications. Discharged in much improved condition.

CASE III.—J. B., female, aged twenty-two years. History of slight rheumatism. Dyspnœa and œdema for four months. In hospital two months with prolonged high intermittent fever. Loud mitral systolic and aortic diastolic murmurs. No chills or sweating. No malarial organisms found (two examinations). Leukocytes, 18,000, 7000, 11,000. On admission petechial spots, rather old, and murmurs over both lower extremities. Comfortable most of the time while in the hospital. Blood culture negative. No complications except three large intestinal hemorrhages in one day. Discharged improved.

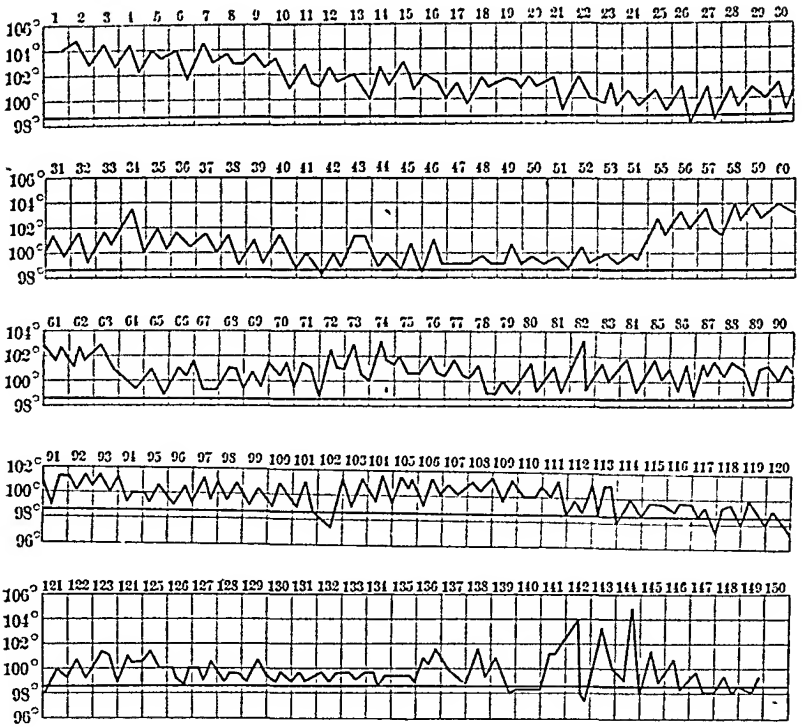
CASE IV.—A. M., female, aged twenty years. No previous history of rheumatism; palpitation for one year. Two weeks before admission to the hospital vaccination took; one week later chilly. On admission a double murmur was heard at the apex, and later a diastolic at the base and the pulse became "Corrigan." The heart was much enlarged. She was in the hospital about six weeks; the first four days the temperature ranged between 102° and 103.6°, and then gradually came down to normal at the end of three weeks. The liver and spleen were a little enlarged. The leukocytes were 8000, 18,000, and 8000. Two blood cultures were made with negative results. The Widal test was negative on three trials. Ten months later she returned with a gastrointestinal disturbance and the same cardiac condition, except that the mitral presystolic murmur was not heard. She was in the hospital two weeks, but only on the first day did the temperature exceed 99.5°. The leukocytes were 5000.

CASE V.—L. T., female, aged thirty years. History of severe rheumatism, but none in hospital. Mitral presystolic and systolic murmurs. Albumin, 30 per cent.; no complications. In the hospital five weeks, with frequent irregular shoots of fever, though only four times above 102°. The last two weeks only once above 100°. Discharged not improved.

CASE VI.—C. K., male, aged ten years. History of considerable rheumatism, but none while in the hospital. Cardiac symptoms for five years. In hospital five weeks with irregular, moderate, intermittent fever. There were no complications. He seemed to improve, but died two weeks after leaving the hospital.

CASE VII.—I. H., female, aged thirty-nine years. No history of rheumatism. No rheumatism while in the hospital. In hospital two months, with irregular, usually moderate elevation of tempera-

CASE I.



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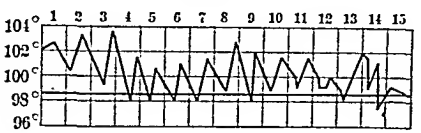
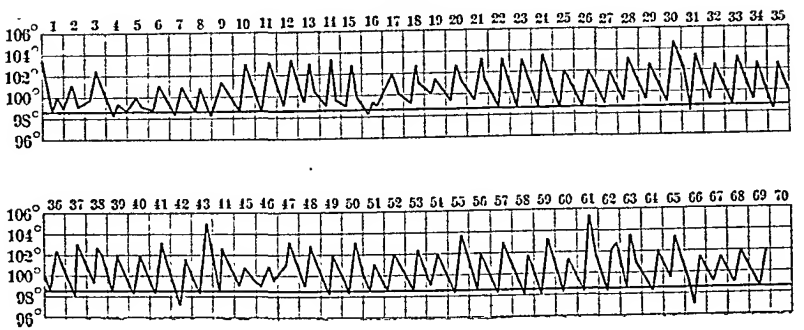
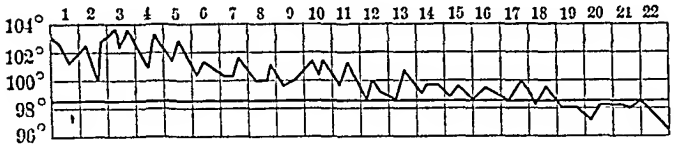


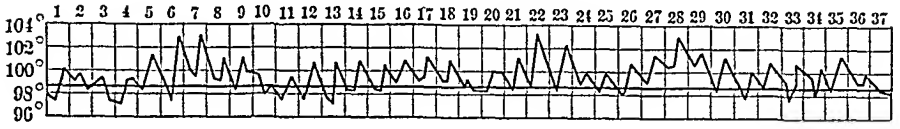
CASE III.



CASE IV.



CASE V.



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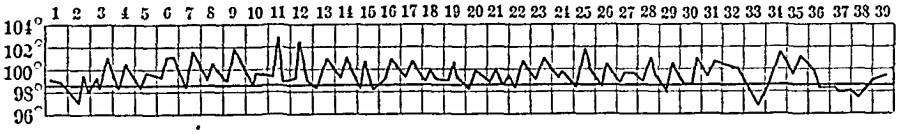
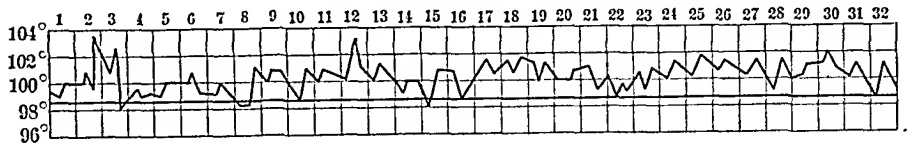


CASE VII.



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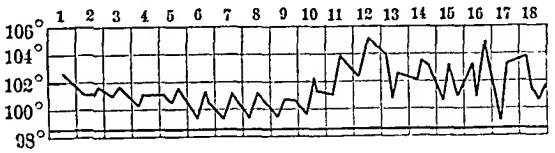

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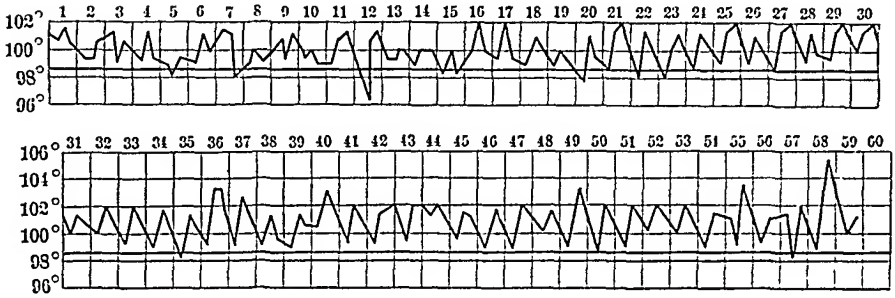
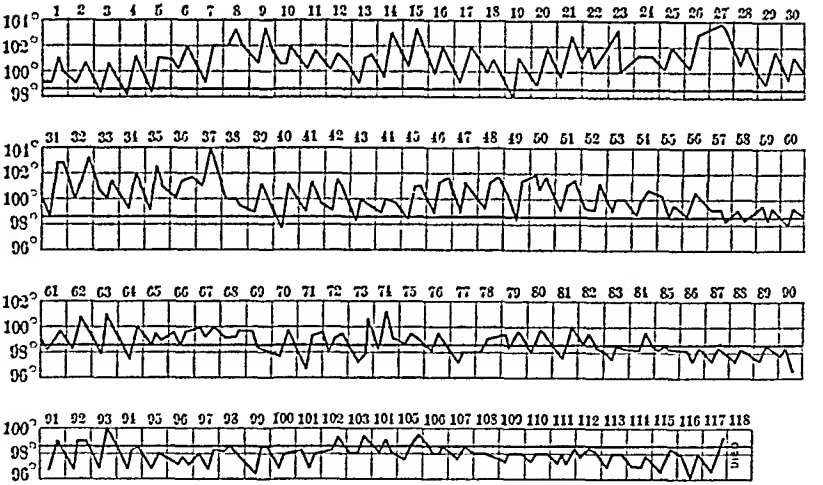
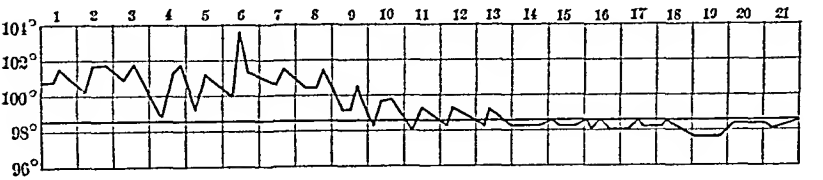


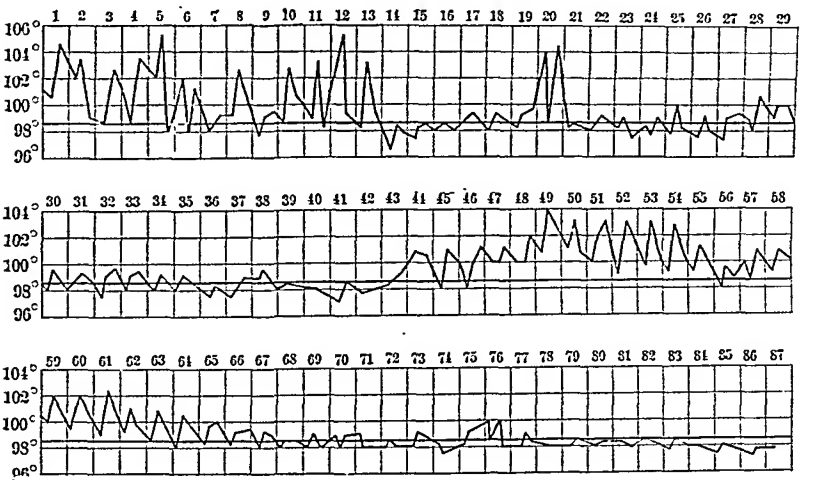
CASE X.



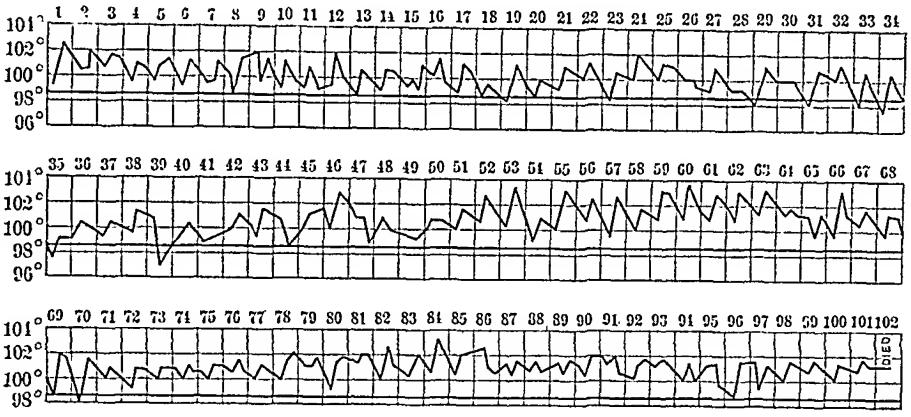
CASE XI.



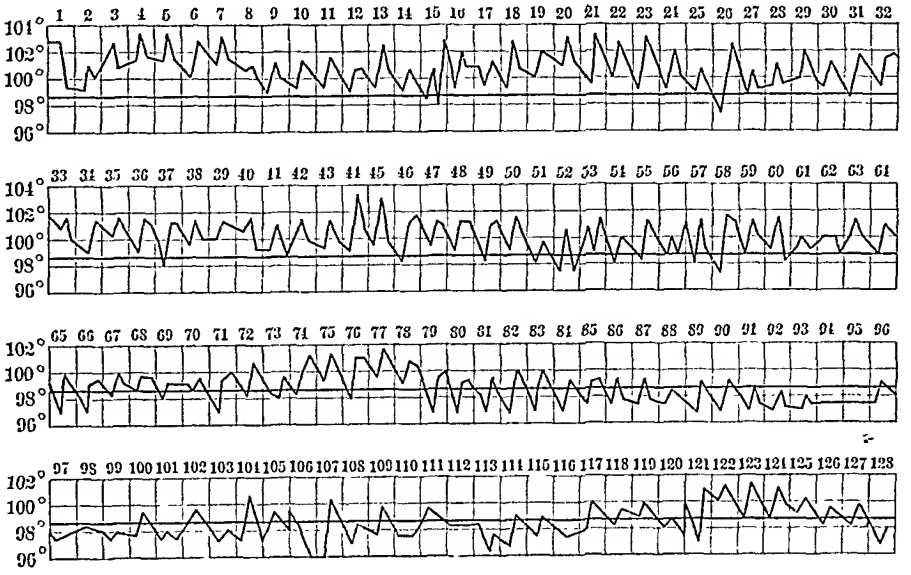
CASE XII.



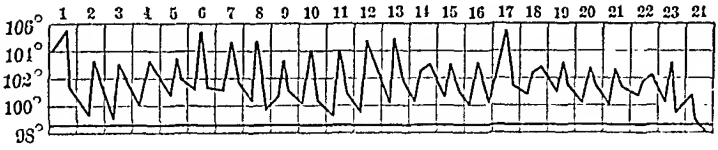
CASE XIII.



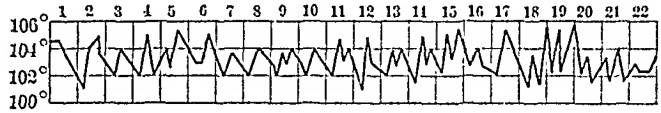
CASE XIV.



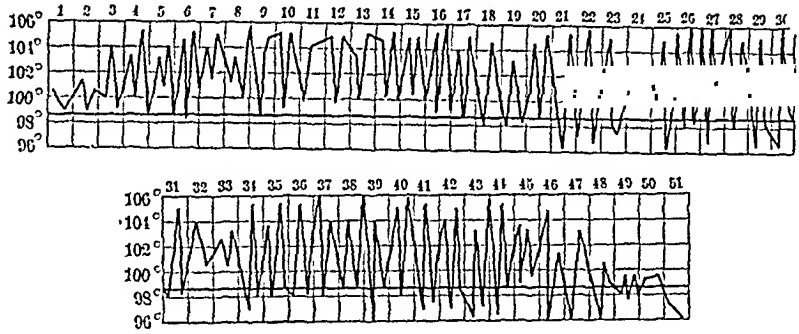
CASE XV.



CASE XVI.



CASE XVII.



ture. No complication. Aortic and mitral systolic murmurs. Died. Autopsy showed sclerotic valves, especially the mitral and tricuspid. No complications to explain the fever.

CASE VIII.—E. L., female, aged thirty years. No history of rheumatism. In hospital two and one-half weeks. Aortic systolic and mitral systolic murmurs. Albumin up to 30 per cent. Temperature uneven, with remissions generally moderate. No complications. Discharged unimproved.

CASE IX.—M. B., female, aged nineteen years. Only doubtful history of rheumatism. No previous cardiac symptoms. In hospital two months, with moderate, rather irregular, remittent, and intermittent temperature. No Widal reaction. No tuberculin reaction. Leukocytes, 7500. Urine normal. No complications. Discharged unimproved.

CASE X.—M. W., female, aged fifteen years. History of considerable rheumatism. In hospital four months, with very irregular, remittent temperature the first two months, after that, rarely fever. Albumin up to 30 per cent. Symptoms apparently the same during the febrile and the afebrile periods. No complication while in hospital. Died. No autopsy.

CASE XI.—J. K., female, aged forty-five years. No history of rheumatism. Cardiac symptoms for two months. In hospital three and one-half weeks. Mitral systolic murmurs. No joint symptoms. Moderate, irregular temperature for ten days, and normal for ten days. Discharged improved.

CASE XII.—B. M., female, aged eighteen years. History of considerable rheumatism. Cardiac symptoms for two years. No rheumatism in hospital. Mitral presystolic and systolic murmurs and a diastolic at apex. No complications. In the hospital three months. During the first three weeks very irregular, high, intermittent temperature; later, a remittent wave of about three weeks. The rest of the time mostly normal, including the last three weeks in the hospital. Discharged and was in fair health for three months, but died seven months after leaving the hospital.

CASE XIII.—L. J., female, colored, aged thirty-nine years. Cardiac symptoms eight months; well-marked rheumatic history. In hospital three months. Temperature of long, irregular waves, with marked remissions. Mitral systolic and presystolic murmurs. Albumin up to 60 per cent. No complications. Died. No autopsy.

CASE XIV.—M. B., female, aged twenty-five years. History of much rheumatism. In the hospital four months. Double murmurs at apex; later, double murmurs at base. Albumin up to 25 per cent. Numerous crops of purpuric eruptions, the last was two days before death, but the temperature, which was irregular and remittent the first two months, was below 100° most of the last two months. The autopsy showed much sclerosis of aortic, mitral, and tricuspid valves, with only slight granulation.

CASE XV.—W. B., female, aged nineteen years. History of slight rheumatism; none in the hospital. In the hospital four weeks, with a high, fairly regular, deeply remittent temperature. Mitral systolic and presystolic murmurs. An attack of hemiplegia two days before admission. No petechiæ. Blood culture obtained growth of pneumococcus. Autopsy. No fungating masses on the valves, but a fringe of vegetations on the mitral valve and extending to the adjacent ventricular surface. Pneumococci were obtained from autopsy cultures.

CASE XVI.—A. C., male, aged thirty-four years. In hospital twenty-four days with a petechial eruption and high, not markedly remittent temperature. History of slight rheumatism. Cardiac symptoms only a few days before admission. Systolic murmur at apex. Edge of spleen palpable. Widal test negative; many trials. Blood cultures negative; three times. Died. Autopsy showed a "wet brain" and slight thickening of the mitral valves.

CASE XVII.—E. G., female, aged thirty-eight years. History of slight rheumatism; also some slight joint pains while in the hospital. No previous cardiac symptoms. In the hospital seven weeks, with very high intermittent fever, usually two waves daily. Double murmur at base; systolic at apex. No petechiæ. Autopsy. On one aortic cusp a polypoid mass-like granulation tissue, with surface slightly irregular, but without ulceration. Infarction of the spleen.

ON THE USE OF OPIUM IN MYOCARDITIS, WEAK HEART, AND DILATED HEART.

BY J. H. MUSSER, M.D.,
OF PHILADELPHIA.

THERE are sound clinical reasons for the belief that opium is a tonic in cardiac debility. Who has not seen the flagging heart of shock induced by pain or other depressive measures brought up

by morphine? Who will not prescribe this drug in the sudden heart failure of myocarditis—the asystole with the accompanying œdema of the lungs of this affection? Who does not give it in rheumatism for its tonic cardiac effect? I plead for the continuous use of opium or morphine also in myocarditis to prevent angina pectoris, or to lessen the effect or defer the dreaded asystole. I have had patients take for months and months small doses of the deodorized tincture or the extract of opium, thereby checking waste, reducing the susceptibility to peripheral sensations which fret an irritable heart, replacing exciting stimulants, as alcohol and strychnine, calming a perturbable nervous system, and lessening the necessity for food to the relief of digestion, metabolism, and elimination.

In cases of weak heart after exhausting disease, after prolonged mental and physical pain, and without organic lesion of valves or muscle opium is of advantage.

In cases of failing compensation, with the onset of stases, the heart is supported, especially if the unfortunate possessor is an impressionable subject who frets and fumes because of the ordinary irritations of life.

In the gradual engorgements from myocardial dilatation, in chronic parenchymatous nephritis, and in arteriosclerosis it is of value. If the patient is hypochondriacal or hypersensitive the second daily dose of opium invites sleep and induces a feeling of well-being.

The dyspnœa of myocarditis is relieved or prevented by continuous small doses of morphine for a very long time. I have seen a form or stage of myocarditis with restlessness, Cheyne-Stokes breathing, dyspnœa, and rapid pulse helped by continuous doses of opium. The tachycardia of Graves' disease is relieved, and in three of my instances it appeared to contribute to the cure of the disease. In the nervous and irritable subjects opium is almost necessary to induce comfort.

A REVIEW OF THE CASES OF DISEASE OF THE HEART MUSCLE TREATED IN THE SECOND MEDICAL DIVISION OF THE BELLEVUE HOSPITAL OUT-PATIENT DEPARTMENT FROM NOVEMBER, 1903, TO JUNE, 1905.

By Theodore B. Barringer, Jr., M.D.,
INSTRUCTOR IN MEDICINE IN THE CORNELL UNIVERSITY MEDICAL COLLEGE.

Among the 2127 patients treated during this period there were 89 cases of heart disease, of which 57 were classified as valvular disease, 22 as disease of the heart muscle, and 10 not at all, owing to incomplete data.

In a dispensary service the small percentage of patients returning for treatment necessarily limits the opportunities for extended observation of individual cases, and increases the difficulty of making a diagnosis of myocardial disease, whose recognition, even under the most favorable conditions, is very perplexing.

As Regards our Classification. All diseases of the heart muscle, if they are evidenced at all during life, have one result in common—namely, insufficient work by the heart—whereby the circulation is so slowed that the demands of the body are not satisfied. Clinically we recognize this cardiac insufficiency by a syndrome of symptoms—subjective cardiac disturbances, objective changes in the heart and pulse, œdema of the lungs, dyspnœa, swelling of the liver, œdema of the legs, decreased quantity of urine, etc., and of these the last four are the most reliable.

Having decided that cardiac insufficiency exists, the difficult part of the diagnosis is now to determine what has caused the cardiac insufficiency. Whether lung disease, nephritis, obesity, muscular overstrain, coronary sclerosis, adherent pericardium, or chronic myocarditis is the underlying causal factor. Strictly speaking, valvular disease, in view of its effect on the heart muscle, should also be considered a cause of this condition.

Dividing our cases on this very practical etiological and clinical basis, which is much in favor with German clinicians, we find the cardiac insufficiency to be due in 4 cases to chronic nephritis, in 5 cases to disease of the coronary arteries, in 2 cases to muscular overstrain, in 1 case to adherent pericardium, and in 10 cases to chronic myocarditis.

Group 1. Cardiac insufficiency in chronic nephritis. The sequence of events in these cases is somewhat as follows:

The nephritis, generally of the interstitial variety, has already produced a cardiac hypertrophy, but is not itself in a terminal stage. Then myocarditis, muscular overstrain, coronary sclerosis, overindulgence in alcohol, or some other heart-weakening event supervenes and damages the heart muscle so that it is no longer able to do the extra work which nephritis entails, and a condition of cardiac insufficiency results.

Uræmia frequently follows from the impairment of the kidney circulation, but there are a certain number of cases in which the uræmic symptoms are absent or slight, where the heart symptoms dominate the picture, and where treatment of the cardiac condition restores the patient, at least temporarily.

Case I.—W. C., an ice man, aged thirty-two years, was treated in Bellevue Hospital in February, 1903; July, 1904, and from January to June, 1905, for chronic parenchymatous nephritis. On the last of these occasions he suffered from marked œdema of the legs and face, ascites, and chronic uræmia. His heart was hypertrophied, showing a heaving apex beat, ringing and accentuated

aortic second sound, and a very high tension pulse. During the latter part of May he passed from 2950 to 3550 c.c. of urine daily, showing a specific gravity of 1009 to 1012, a marked quantity of albumin, and granular and hyaline cysts. He came to the dispensary June 25th of this year complaining of distressing attacks of dyspnœa at night, lasting an hour or more, and shortness of breath on exertion.

Status Præsens. A well-built man, somewhat emaciated, with pallid skin and mucous membrane, dyspnœic, and showing slight cyanosis of the lips. There is no œdema of the legs. Numerous subcrepitant rales are heard over the base of the left lung. The apex beat is feeble and displaced outward. The percussion area on the right extends 1 cm. beyond the right sternal border. The action is rapid, regular, and a gallop rhythm is heard over the entire præcordium. The aortic second is slightly accentuated, the pulse is 118 per minute, regular, and shows some tension. The superficial arteries are thickened markedly. The edge of the liver is felt 9 cm. below the free border of the ribs in the midclavicular line. He is passing but 1770 c.c. of urine in twenty-four hours, with a specific gravity of 1010.

Under cathartics, digitalis, and nitroglycerin the pulse came down to 90. His dyspnœa almost disappeared and the quantity of urine increased.

It is interesting to note that although the urine, as the result of nephritic congestion, was reduced from 2950 c.c. (his output on leaving the hospital) to 1770 c.c., the specific gravity still remained low. Romberg calls attention to this peculiarity of cases of cardiac insufficiency in interstitial nephritis—the passing of a decreased quantity of light-colored urine of low specific gravity instead of dark-colored urine with high specific gravity, which we ordinarily find in the nephritic congestion of cardiac insufficiency. In the absence of albumin this would afford a valuable clue as to the original cause of the heart condition.

The above case is the only one of the group presenting this feature.

Case II.—K. I., a laundress, aged forty-five years, had scarlet fever and diphtheria in childhood, and has been a heavy drinker for some years. For the past three weeks she has had dyspnœa on exertion, swelling of the feet and legs, and numerous attacks of shortness of breath at night, forcing her to sit up in bed.

Status Præsens. An obese dyspnœic woman with alcoholic facies, slight icterus of the conjunctivæ, and marked œdema of both legs. There are subcrepitant rales at the base of the right lung. The apex beat is displaced outward in the fifth space and is feeble. The heart is very irregular in action with the first sound of poor muscular quality. There are no murmurs, and no accentuation of the second sound. The pulse is 120 to the minute, very irregular

in force and frequency, and of low tension. The liver is enlarged and tender, the rounded edge being felt 10 cm. below the ribs in the midclavicular line. The urine, of a specific gravity of 1027, shows a large quantity of albumin and numbers of granular casts.

The patient was given tincture of digitalis every three hours, and two compound cathartic pills every night for four nights. She returned after four days of this treatment very much better. The œdema had disappeared, the pulse, although still irregular, had dropped to 90 and become a little tense. The apex beat was somewhat heaving, and the aortic second sound distinctly accentuated.

Four months later she had another attack of cardiac insufficiency, caused by heavy drinking. Her obesity also undoubtedly played a part in producing the heart condition.

The remaining 2 cases of this series complained of dyspnœa on exertion; showed enlarged hearts with gallop rhythms, rapid, regular, and low-tension pulses, and urine with rather high specific gravities, marked quantities of albumin and granular casts.

These 4 cases are the only ones whose selection as types of this form of disease of the heart muscle was warranted by the prominence of the cardiac symptoms.

In addition to these there were 14 cases of nephritis showing a high tension pulse and cardiac hypertrophy, and suffering from either dyspnœa on exertion or constant dyspnœa. This dyspnœa could not be considered an evidence of cardiac insufficiency, but rather a result of the high tension pulse. There were also 5 cases showing cardiac hypertrophy, and a high-tension pulse with no subjective disturbances.

Group 2. Cardiac insufficiency due to sclerosis of the coronary arteries.

CASE I.—Mrs. A., aged fifty-eight years, housewife, gave the following history: Her father died of nephritis. Her mother from apoplexy and her husband from angina pectoris. She had scarlet fever when young, but never rheumatism. During the winter of 1904-1905 she suffered from dyspnœa on exertion. In January, 1905, the dyspnœa became almost constant. Several times she had severe nocturnal attacks of shortness of breath, obliging her to sit up on a chair for an hour or so. On the night of February 7th she had a severe pain over her heart, running up to the right shoulder and down the inner side of the right arm, accompanied by dyspnœa and a cold perspiration. This lasted more or less all night, and she volunteered the information next day that she thought she was going to die.

Status Præsens. A thin, pallid, dyspnœic woman with no cyanosis or œdema. The lungs show numerous subcrepitant rales at the right base. The apex beat is felt 12 cm. from the median line in the fifth space, and is not heaving. At the apex is heard an almost continuous peculiar rumble with at times a suggestion of

gallop rhythm. The muscular element of the apex sound is very poor, and the second sounds are feeble. The pulse is 100 full, regular, and of low tension, and intermits occasionally. All of the superficial arteries are sclerosed. The liver is not enlarged.

February 9th. No murmurs were heard over the heart, the dyspnœa was better; 628 c.c. of urine were passed in the twenty-four hours, with a specific gravity of 1025, ½ gram of albumin to the litre, full of urates, and showing microscopically a few hyaline casts.

13th. The apex beat was slightly heaving (she had taken small doses of digitalis and nitroglycerin). That afternoon there was a slight attack of pain in the right shoulder and arm. During the night she started up suddenly in bed and seemed in great pain, and died in a few minutes.

In this case the insufficiency of the left ventricle was evidenced first by the feeble and dislocated apex beat, the poor muscular quality of the first sound, the suggestion of gallop rhythm, and the rapid pulse; and secondly, by the dyspnœa, the congestion of the right lung, and the decreased quantity of urine.

The attacks of angina and cardiac asthma seem to show definitely that sclerosis of the coronary arteries was the underlying cause of the cardiac insufficiency.

CASE II.—W. H., a clerk aged fifty-seven years, has never had lues or rheumatism, and is of excellent habits. During 1898 he had several fainting spells, and his physician told him he had "heart trouble." In 1902 he began to have attacks of pain in his chest. The pain would begin in the left axilla, radiate across the upper part of the sternum, to the right side, and frequently down the right arm to the wrist, where it seemed to centre "over the pulse." It felt as if a "red-hot iron were being drawn across the chest," and he would immediately sit down and remain quiet. These paroxysms lasted from a few minutes to a half-hour. After a few months the pain ceased to affect the right wrist, but was localized "under the breast bone."

At present, May, 1904, the pain comes on frequently, sometimes at night, but generally after a full meal or when he is excited ("excitement acts just like a full meal"), or when walking against the wind. He is also troubled with shortness of breath on but slight exertion, epigastric oppression, and belching of gas.

Status Præsens. A pallid, slightly dyspnœic man, of full habit. He shows no pretibial œdema. The apex beat, heaving and with sudden fall, is felt in the fifth space 11 cm. from the median line. All of the superficial arteries pulsate. There is dulness over the base of the sternum and in the adjacent portions of the second and third right interspaces. Systolic and diastolic murmurs are present over the entire præcordium, the former being heard all over the upper portion of the chest. The pulse is 96, regular, and of Corrigan type. There are a few moist rales at the base of the right lung.

The liver is not enlarged, but very tender on pressure. He is passing 1500 c.c. of urine in the twenty-four hours with a specific gravity of 1019, no albumin or sugar, and a few hyaline casts.

A week later he had a number of typical attacks of the cardiac asthma at night, and his general condition was worse, the dyspnœa becoming more marked, and the heart action faster. I did not see him again, but his family physician told me that he became constantly dyspnœic, took to his bed, and after five days of terrible suffering died. The chief symptoms during his last illness were the dyspnœa, a rapid and irregular pulse of low tension, several attacks of œdema of the lungs, extreme irritability of the stomach, œdema of the legs, and a very much decreased quantity of urine of high specific gravity, with traces of albumin. The anginal pains ceased. A very typical picture of cardiac insufficiency arising from disease of the coronary arteries.

In this case sclerosis of the aorta evidently produced the lesion of the aortic valves, and later disease of the first portion of the coronary arteries. The coronary affection, as in the preceding case of this group, was shown first by the numerous attacks of angina pectoris and later by the attacks of cardiac asthma. The coronary disease would seem to be the determining factor in the production of the cardiac insufficiency and not the valvular trouble.

The 3 other cases of this series showed typical attacks of angina pectoris of a less severe form and evidences of cardiac insufficiency; but although there was dyspnœa on exertion, there was no attacks of cardiac asthma. They also showed accentuated aortic second sound, and in 2 cases note is made of the low tension and irregularity of the pulse.

The first 2 cases of this group present classical pictures of disease of the heart muscle from coronary sclerosis, and a very interesting association of attacks of true cardiac asthma and angina pectoris, both arising probably from the same cause. The distressing shortness of breath in this condition suggests those cases of arterial sclerosis and interstitial nephritis, accompanied by high tension pulse and dyspnœa, but the differential diagnosis is not difficult.

In the 3 remaining cases the only evidences of coronary sclerosis were the attacks of angina and the few physical signs pointing to sclerosis of the first portion of the aorta.

Group 3. Cardiac insufficiency from muscular overstrain.

CASE I.—T. M., laborer, aged thirty-eight years, came to the dispensary June 8, 1904, complaining of shortness of breath and swelling of the feet and scrotum.

He had been a heavy drinker for some years. On June 1st he lifted a bar of iron weighing about 300 pounds. A few minutes after he experienced a dull præcordial pain, and that night was troubled with palpitation. The pain continued and the next day

he was short of breath and his feet were swollen. The swelling and the shortness of breath have increased.

Status Præsens. A well-nourished, thick-set, plethoric man, dyspnœic, with slight cyanosis of the lips, ears, and finger tips, and marked œdema of the feet, legs, prepuce, and scrotum. The carotids are pulsating violently. The lungs are not enlarged, and show signs of a slight bronchitis. The apex beat is diffuse, not forcible, and most intense below and external to the nipple. The cardiac dulness extends 1½ cm. to the left of the nipple line and 1 cm. beyond the right border of the sternum. The action is rapid. The first sound at the apex is valvular in character, and the pulmonic second sound is accentuated. The second aortic sound is indistinct over the aortic area, but heard clearly at the apex. A distinct localized systolic murmur is heard at the apex. Over the aortic area are heard clearly faint systolic and diastolic blows. The pulse is 120, regular, of slightly increased tension, and with a quick rise and fall. There is some œdema of the lower zone of the abdominal wall and the superficial abdominal veins are slightly dilated. The liver dulness begins at the fifth space in the nipple line, and the edge is felt distinctly 6 cm. below the free border of ribs. The urine on several examinations showed neither albumin nor casts.

The patient was sent up to the ward and twenty-four hours later the heart had quieted down, all murmurs had disappeared, the œdema was much less, and in a few days he was discharged cured.

On June 25, 1905, this patient still remained in good health, had no dyspnœa on exertion, and physical examination showed a normal heart. After exercise the pulse was 88 to the minute.

The history and physical examination of this case were confirmed by the late Dr. J. M. Polk.

The second case was that of a coal-passer, whose quite heavy work was done in a room where the temperature ranged between 130°. His heart gave out, the chief symptoms being dyspnœa and palpitation. I saw him one year after this for the first time, and he still complained of dyspnœa on exertion and palpitation. Objectively he showed nothing except perhaps a rather easily quickened pulse.

Group 4. Cardiac insufficiency from adherent pericardium.

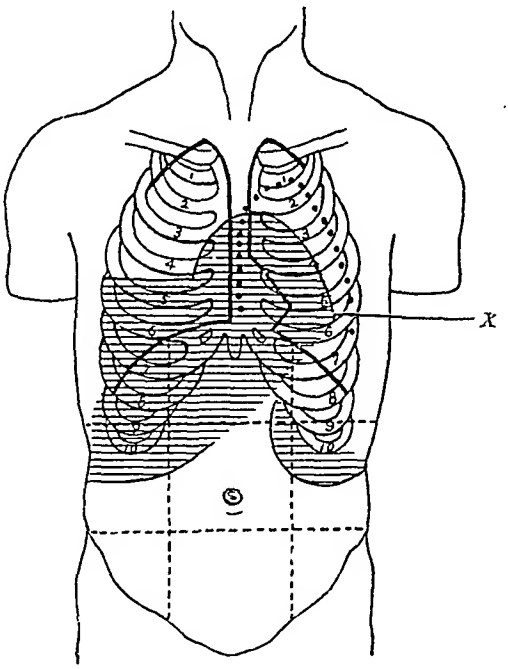
R. D., aged fifteen years, a school boy, was seen in July, 1904, complaining of shortness of breath.

During childhood he had measles, whooping-cough, and scarlet fever. From 1899 to 1900 he had lived in a malarial district, and suffered from numerous attacks of "fever and ague." In 1901 he was taken sick rather suddenly and his physician diagnosed heart trouble. He was in bed for two months, and various other diagnoses (sarcoma of liver, congestion of liver, etc.) were made. Three or four months later his feet became swollen and he began to suffer from dyspnœa on exertion. At times he became blue. For the

past two years he has been comparatively well, but is always short of breath on exercising.

Status Præsens. A large, well-nourished, well-built boy of good color. He became a little short of breath as the examination progresses. There is no pretibial œdema. The right external jugular vein is prominent, but there is no diastolic collapse or regurgitant pulsation seen.

A gallop rhythm is heard at the apex, the pulmonic second sound is accentuated, and the aortic second normal. No murmurs are



X, apex beat which is seen distinctly in the fifth space eleven centimetres from the median line. An area of systolic retraction represented by the dotted line is present. It extends from a point immediately to the left of the centre of the sternum almost to the axilla and up under the clavicle. A very distinct rebound (synchronous with the second sound) is seen and felt over this area. The apex beat is heaving and moves less than one centimetre to the left, but became more distinct when the patient turns on his left side. The cardiac dulness extends two and one-half centimetres beyond the right border of the sternum, and twelve centimetres to the left in the fifth space.

heard. The pulse is regular, small, of low tension, 100 to the minute, and is not paradoxical. The motility of the lung border overlying the heart was not tested. The lung shows dulness and decreased expansion at both bases (due to the large liver and spleen). There is no Broadbent's sign. The abdomen appears decidedly enlarged. The liver dulness begins in the fifth space and the rounded edge can be felt 7 cm. below the free border of the ribs at the ensiform, and 12 cm. below at the nipple line. The hard edge of the spleen is felt 10 cm. below in the nipple line. There

is no free fluid in the peritoneal cavity. In this case the early and persistent congestion of the liver and spleen points to an insufficiency of the right ventricle, whose wall, as a result of the anatomical relation, is affected much more than that of the left ventricle by an adherent pericardium. The blood and urine examinations are absolutely normal.

Group 5. There remains a group of 10 cases showing evidences of cardiac insufficiency, in which the underlying cause was provisionally diagnosed as chronic myocarditis. The direct recognition of this condition is extraordinarily difficult, and our rather questionable conclusions were reached more by a process of exclusion than anything else. That is, none of the cases showed evidence of nephritis, muscular overstrain, coronary sclerosis, obesity, or adherent pericardium.

In none of our patients was the heart hypertrophied. That is, there was no suggestion of heaving about the apex beat, nor any accentuation of the second sound. *Myocarditis per se does not* cause hypertrophy, but myocarditis often attacks an hypertrophied heart, in which case the diagnosis is always more than problematical.

The two following histories form typical examples of this group of cases:

CASE I.—J. F., printer, aged twenty-eight years. He has had measles, scarlet fever, whooping-cough, three attacks of inflammatory rheumatism, and three attacks of gonorrhœa. His habits have been alcoholic. For the past four weeks he has suffered from shortness of breath on exertion, for three weeks from cough, and for two weeks from œdema of the feet and ankles.

Status Præsens. His lungs show signs of bronchitis. The apex beat cannot be seen or felt. The heart percusses to the right border of the sternum and 12 cm. to the left of the median line in the fifth space. The action is very irregular, and there are no murmurs or accentuation of the second sounds. The first sound at the apex is prolonged and weak. The pulse is 100, of low tension, and markedly irregular in force and frequency. The radials and brachials are thickened. The edge of the liver is felt 6 cm. below the ribs in the nipple line. The urine is of a specific gravity of 1020, and shows a trace of albumin, but no casts.

The patient died in the hospital a few days later, with a diagnosis of alcoholic delirium and acute cardiac dilatation.

CASE II.—T. K., 'longshoreman, aged fifty-three years. He has had numerous attacks of arthritis involving the small joints of the hands and feet, and sometimes the knees and hips. For five years he has suffered from dyspnœa on exertion, which has been worse of late. His habits are alcoholic.

Status Præsens. A powerfully built man, five feet nine inches tall, weighing 198 pounds. He is dyspnœic (respiration 32 per minute). The lungs are negative. The apex beat is diffuse and

felt indistinctly in the fifth space 11 cm. from the median line. The heart action is markedly irregular, but no murmurs or accentuated sounds are heard. The pulse is 142 per minute, very irregular in force and frequency, and of low tension. The radials and brachials are sclerosed. The liver is enlarged. He is passing twenty-four ounces of urine in the twenty-four hours, showing a specific gravity of 1026, a trace of albumin, and no casts.

Six of the patients of this group were between forty and fifty years of age. Seven gave a history of heavy drinking; 5 of infectious diseases, 1 of syphilis, 1 of lead poisoning, and in 3 there was nothing to account for the cardiac condition.

All of our patients were dyspnœic on exertion, 3 had typical attacks of cardiac asthma, 6 had subjective cardiac disturbances (palpitation, oppression, etc., but no anginal pain), and 6 suffered from cough. The heart and pulse were irregular in 8 cases. One showed a bradycardia (58) and 2 attacks of tachycardia (pulses of 160 and 172).

One of the cases of tachycardia for two months showed a marked œdema of the legs, enlargement of the liver (his habits were excellent), emphysema of the lungs, and an apparently normal heart. The urine was quite normal, and an explanation of the œdema was not forthcoming until one day he appeared complaining of oppression in the chest, and we found that his heart was beating at the rate of 160 to the minute. He recovered on digitalis, and after this experience the muscular sounds of the apex always seemed weak and feeble.

I am indebted to Dr. Hastings, Dr. Roper, and Dr. Warren for the blood and urine examinations of these cases.

THE CLASSIFICATION OF THE CASES HERETOFORE CALLED RHEUMATOID ARTHRITIS.

By P. William Nathan, M.D.,
of New York.

This is the first of a series of papers on the joint diseases heretofore classified as rheumatoid arthritis, chronic rheumatism, arthritis deformans, pseudo-rheumatism, etc., which I hope to publish at intervals in the near future. The first two or three papers are intended to be preliminary, and will in a broad way deal with the classifications of these diseases. In these preliminary papers it will be noticed that the facts which have lead to some of the conclusions are not mentioned in detail. These are purposely omitted because the plan is to start out with a comprehensive view of the whole subject and too many details by complicating it might, I

fear, frustrate this plan. However, these facts will all be brought out in detail when the individual diseases are dealt with separately.

All the joint diseases can be naturally divided into two great classes: (1) those which begin primarily in the intra-articular membranes, and (2) those which begin or involve the bones primarily.

The present paper deals with the classification of the primary arthritides or simply arthritis.

Attempts to classify the various forms of chronic joint disease date back to the dawn of scientific medicine. The tendency has always existed, and apparently still exists, to bring all those cases of joint disease which run a protracted and progressive course, which are attended by gradual loss of function and deformation, and which cannot be ascribed to a positive etiological factor, into a single group.

The majority of observers are more or less agreed upon designating this group rheumatoid arthritis; not because they believe that the disease is in any way associated with rheumatism, but because the name is so well established in the literature that they are loth to change it; the more so because they are unable to call the disease by a name more apt or one which more definitely expresses the pathology or etiology of the condition.

Naturally, with the lines so broadly drawn, there was infinite room for controversy. Numerous joint affections with a chronic course and leading to immobility and deformation were classified as rheumatoid arthritis. And as at the onset the concomitant symptoms and the complications described were of a diverse character, each of the numerous writers upon this subject described the symptom-complex of his own particular case or cases, which he considered characteristic of the condition, and which he thought should be accepted as the standard for the classification of all the other cases.

When we consider that all the various groups of chronic deforming arthritis, now known to be due to the most diverse causes, and having absolutely no etiological connection, such, for instance, as those occurring in the course of organic nervous diseases, the toxæmias of pulmonary tuberculosis, bronchiectasis, syphilis, and those due to acute infectious diseases like measles, scarlet fever, pneumonia, gonorrhœa, typhoid fever, etc., were all thrown together in a class with chronic arthritis of unknown etiology, we can readily understand how difficult it must have been to form a comprehensive idea of the subject. For even at the present time, when so large a part of the diverse elements, which formerly prevented all attempts to form a scientific classification, or even a temporary grouping of the cases, have been more or less perfectly segregated, the confusion is still great, and a classification, acceptable to the majority of authorities, has not been forthcoming. We may, of course, as a

great many observers are content to do, consider all these non-suppurative joint diseases with an unknown etiology which ultimately result in ankylosis and deformation, under one head as rheumatoid arthritis. But such a classification, aside from the fact that it is not scientific, is misleading and has caused endless controversy.[1]

Such a grouping of the cases is responsible for the persistent search, often frantic efforts, to fasten a single etiological factor upon all the cases. So, for instance, certain writers, Schüller, Bannatyne, and others, have found what they consider specific micro-organisms in the joints of their cases. But not only have no other observers been able to confirm their findings, but no two of those who have found micro-organisms at all have described the same species of bacteria.

Besides the actual presence of the bacteria, those who believe the disease to be infectious (that is, caused by micro-organisms) base their view upon the fact, that the disease often begins acutely and is ushered in by general constitutional disturbances (fever, rapid pulse rate, etc.), and is complicated by equally as great a percentage of cardiac complications as acute rheumatism.

But those who hold this view are at the present, at any rate, in the minority. The majority of writers seem to believe that the disease is of a chronic constitutional character, though they are not, by any means, agreed as to the exact constitutional vice.

Some hold that it is of a metabolic nature, a dyscrasia; the symmetry of the lesions, the general symptom-complex of the so-called rheumatoid diathesis being the evidence upon which they base their conclusions. Opposed to this view is the great body of neurologists, who consider that the symmetry of the lesions, the gradual advance of the pathological change from the periphery to the centre, the trophic disturbances, the anomalies of sensation (paræsthesia, formication, etc.), the similarity of the changes in the joints to those which occur in connection with the well-known organic nervous diseases, point unequivocally to a neural disturbance as the cause.

This view, again, has not found favor with those not especially engaged in neurology. It has been shown by Pribrim and others that the joint symptoms of the so-called rheumatoid arthritis and those of known organic nervous diseases (tabes, syringomyelia, etc.) are not exactly analogous, the onset and course being entirely different; only the end results being the same. Thus bone changes are present early in the arthropathies of organic nervous disease, while they appear late or may be entirely absent in the forms of chronic

[1] It would have been a hopeless undertaking to review the various attempts to classify these joint diseases: The majority of them are confusing rather than elucidating. Only one, recently proposed by Goldthwaite, though based upon external conditions alone, has at least the merit of being a good working basis for the study of these diseases.

non-suppurative arthritis now under discussion.[1] Moreover, the large joints are more apt to be involved in organic nervous disease and the lesions correspond to the segment of the cord affected.

However, in spite of the great diversity of opinion as to the etiology of the condition, the vast majority of writers seem to be agreed that rheumatoid arthritis is a well-defined specific disease; and no matter how greatly the various cases may differ from one another as to the onset, the symptoms, and the course they pursue, there seems to be an ineradicable belief in the minds of practically all medical writers that all these cases are representative of a single pathological entity.

Thus, excluding the forms of chronic arthritis which are secondary to bone diseases (osteoarthritis, osteoarthritis deformans), and those due to a known cause (pneumococcus, gonococcus, etc.), we find the following types of cases described as rheumatoid arthritis:

(*a*) The disease begins more or less suddenly with a rise in temperature, increased pulse rate, and general constitutional symptoms. The joint symptoms are at first acute or subacute, there is also pain and effusion.

(*b*) In these the onset is more or less sudden, but the temperature may be normal or so slightly raised that it remains unnoticed. There is, however, marked increase in the pulse rate and nearly always general constitutional disturbance. The joint symptoms are similar in type, and as a matter of fact the two only differ as regards the rise in temperature. Either of the types may begin with a more or less distinct chill or chilly sensations. In both these forms the joints primarily affected are the ones which remain diseased. Deformation does not take place immediately, but there are remissions (which may be complete) and exacerbations (which may or may not be accompanied by temperature), until after a variable course lasting sometimes for years the joints become stiff and deformed.

(*c*) The disease begins very acutely, with high temperature and severe constitutional disturbance; a number of joints become markedly swollen and painful; deformation takes place almost immediately and remains permanently.

(*d*) The disease begins acutely with temperature and constitutional disturbance; the joint symptoms are marked, the glands in the neighborhood of the affected joints are swollen, and the spleen is enlarged.

This form of arthritis has been called *Still's disease*, after Still, who first accurately described it, and it is supposed to attack

[1] As a matter of fact, the so-called arthropathies of organic nervous disease are not primary joint diseases at all. The process only involves the joints secondarily after the bone disease has reached a certain stage.

children only. It does, however, occur in adults, for I have seen three cases,[1] two in men and one in a woman.

(*c*) Chronic from the beginning. In these the disease is usually preceded by abnormal sensations (formication, numbness, etc.); the joint symptoms come on very gradually, the disease is uniformly progressive from the beginning, and the peripheral joints are the first to be involved. The joints become moderately swollen, there is rarely redness or acute inflammatory reaction, and very gradually and uniformly, beginning in the fingers or the toes, the joints become stiff and deformed. From the periphery toward the centre new joints are gradually and progressively involved. There is no fever or acute constitutional disturbance, and there are no remissions or exacerbations. The disease nearly always attacks those at or past middle life, and runs a very chronic and uniformly progressive course.

If we examine into the reasons why these various types of disease have been grouped together as rheumatoid arthritis, we find that they have been thus classified because they have three characteristics in common, viz.: (1) they are chronic; (2) they are non-suppurative; (3) they ultimately end in stiffness and deformation.

Apparently these characteristics are decided enough for all practical purposes. But when we come to look carefully into the matter we find that neither separately nor collectively are they suitable to form the basis of a scientific classification of the cases. To be chronic and non-suppurative is characteristic of a large number of diseases which have absolutely nothing else in common; while loss of motion and deformation are common to all joint diseases, and are dependent, not upon the character of the disease, but upon purely mechanical conditions. If, therefore, we are to conclude that the various types of joint disease which now figure as rheumatoid arthritis, really belong in the same category, it is necessary that we find either characteristic clinical manifestations or specific pathological lesions to bear us out.

As far as the pathological findings are concerned, these cases come to autopsy long after any specific lesions, which may have existed, have disappeared; so that, for the present, little is to be expected from this source.

If, on the other hand, we critically compare the clinical manifestations with one another we find that, far from proving all the cases as analogous, they, on the contrary, point with no little certainty to an opposite conclusion. If, for instance, we compare the type *e* with the forms previously mentioned we find a number of differential diagnostic points.

[1] For permission to examine these I am indebted to Dr. E. Libman.

Types *a, b, c, d.*	Type *c.*
Onset.	
Acute or subacute with decided constitutional symptoms.	Always chronic.
Age.	
Occurs at any age.	Usually those at or past middle life.
Course.	
Attended by remissions and exacerbations.	Slowly and uniformly progressive.
Joints Involved.	
May begin in any joint and attack others without regard to their location.	Always begins in the peripheral joints and uniformly attacks adjacent joints toward the centre.
Early Joint Changes.	
Inflammatory in the beginning; only becomes atrophic in the terminal stages.	Never inflammatory.
Joint stiffness and deformity may be severe.	Always mild.
Complications.	
Not infrequently complicated by endocardial and visceral inflammations.	Never complicated by inflammatory endocardial changes.

Besides these differential diagnostic points a certain class of cases which, for the present, I designate as Class I. of type *c*, present a pathognomonic symptom which readily accounts for all the others and at the same time clears up the etiology. This form of arthritis usually occurs in elderly individuals, and if these individuals are carefully examined it will be noticed that they present certain more or less marked abnormalities of the circulation in the extremities. The changes in the circulation are evidently due to an abnormality of the vessels.

It will be noticed that the distal parts of the extremities (the hands, the fingers, toes, and feet) are paler than the normal, and when pressure is made on the skin it takes longer for whatever color there is in the skin to return. The radial pulse is slow and less compressible than normal. The patient complains that not alone the hands but also the arms tire much more easily than formerly. He may have peculiar sensations, formication, and neuralgia-like pains. In a word, has the characteristic symptoms of arteriosclerosis.

These joint symptoms occur particularly in that form of arteriosclerosis which is localized in the extremities, and in which the smaller vessels are prone to be involved. This form of arterial change most closely resembles the so-called normal senile involution. The general symptoms are mild; the heart, kidneys, and other viscera are affected late if at all; the disease is very slowly progressive, and under advantageous conditions the prognosis is favorable as far as longevity is concerned.

The joint symptoms, as well as the other symptoms in the extremities, are due to the changes in the vascularity of the parts and

the consequential deficient nutrition. Such patients suffer much from cold extremities and analogous symptoms, but they do not, as a rule, suffer from cramps of the muscles or intermittent claudication.[1]

The joint changes, like those of the arteries, are senile in character. The capsules and appendages become very gradually thickened by increase of connective tissue; there are calcareous deposits in the surrounding tissues, and the joints gradually become stiff and ultimately deformed.

It must be remembered that, for reasons that need not be enumerated here, the circulatory and nutritional disturbances of the peripheral form of arteriosclerosis may be apparent before actual pathological changes can be demonstrated in the arterial walls. It is therefore not absolutely necessary to demonstrate decided arterial changes in order to confirm the diagnosis in this form of joint disease. The gradual loss of functional vigor in the extremity, the peculiar progressive character of the joint changes, their localization first in the most peripheral joint, and the subsequent involvement of one set of joints after another toward the centre, together with the signs of circulatory disturbance and the absence of the specific symptoms which characterize other joint disease (to be mentioned later) are sufficient to make a positive diagnosis.

The earliest symptoms of arterial disease are very difficult to make out; the disease advances so insidiously that sometimes not even the patients themselves are able to say just when the trouble began. They complain at first of vague indefinite pains and inability to accomplish the usual amount of work; and at this time the symptoms are generally looked upon as neurasthenic. Later when the arterial change is decided, there is, of course, not much danger of overlooking the condition.

But it is absolutely necessary to discover the existence of the malady before the arteries have been seriously damaged, because only at this time can we hope to improve the condition or perhaps stop its progress. It so happens that not infrequently the peripheral joints are early affected by the same deleterious influences as will in the end cause arteriosclerosis; and for this reason these joint changes should be sought for as a ready means of making a diagnosis of beginning arteriosclerosis. It is unnecessary to discuss here the causes which lead to arteriosclerosis; it is sufficient to say that they are metabolic in character and that they induce premature senile involution of not alone the arteries, but what seems as yet little understood, also of all the other tissues. The joint disease here spoken of may be a part of the general protoplasmal deterior-

[1] *The condition under discussion must not* be confused with that form of arterial change which causes intermittent claudication, which appears as an arteritis obliterans and involves a large vessel of an extremity, running a malignant course and resulting in gangrene before there are signs of joint impairment.

ation, or what seems more generally to be the case, the degeneration as a result of deficient nutrition and impaired circulation.

The Class I. of type *e* of the so-called rheumatoid arthritis is, therefore, not primarily an inflammatory condition. What inflammation, if any, exists is simply the chronic inflammatory reaction, which often accompanies degenerative changes. The pathological changes found at autopsy are an exaggeration of those found in the joints of the aged—*i. e.*, atrophy of the synovial membranes which have become displaced by denser connective tissue, atrophy of the ligaments, and fibrillar changes in the joint cartilages.

We have then within the group *e* a certain class of cases representing a distinct chronic joint disease, which accompanies, or is due to the same causes as arteriosclerosis (particularly the peripheral form). This disease is not an inflammation, and, strictly speaking, we are not warranted in calling it an arthritis, much less rheumatoid arthritis. It is rather difficult to give the condition an appropriate name. It is not an arthritis in the strict sense of the word; nor does the name arteriosclerosis suggest a true clinical entity, for the arteriosclerosis is simply the final pathological change of an intricate and as yet little understood metabolic abnormality. However, we have become so used to speaking of arthritis as pertaining to a joint without regard to inflammation (of itself an ill-defined and much-discussed form of pathological change) and arteriosclerosis as a disease, that it would only lead to confusion if we were to attempt to relegate these terms to their proper spheres. I have for this reason, as well as others, which cannot be discussed here, decided to call this particular joint disease now under consideration—the arteriosclerotic form of metabolic joint disease.

It would be simpler to call this condition metabolic arthritis without the qualifying term, but such a course is impossible because there are other more common conditions which have been grouped under type *e*, which are also metabolic in their nature, but which are due to entirely different causes, and which have well-marked and specific symptoms to distinguish them from those cases associated with arteriosclerosis.

In these the disease develops somewhat more acutely than in the arteriosclerotic form. It is not, however, any the less chronic, and the course just as insidious. Still, where the arteriosclerotic form requires years to produce a rather mild deformation, the other causes marked joint change with decided stiffness and deformation in a much shorter time. In fact, while the former rarely causes very marked changes, the latter usually does so in a comparatively short time.

There are, however, rarely acute exacerbation or remissions. The disease is slowly progressive, attacks the peripheral joint first, and gradually makes its way thence to the larger joints toward the centre, just as does the arteriosclerotic form. What distinguishes

it from the latter are the previous history and the concomitant symptoms.

These cases always give a history of having had symptoms of a disturbed metabolism for a long time. These symptoms usually precede the joint symptoms by a considerable period, though there are some cases in which the two seem to come on simultaneously. In a great many of these cases the metabolic symptoms are those which are associated with endogenous intoxication (so-called auto-intoxication) of probable various but as yet little understood kinds.

Numerous French writers are in the habit of calling the general metabolic symptoms associated with chronic joint disease herpetism or arthritism, while in America and England this varying symptom-complex is usually referred to as the rheumatoid diathesis.

What these symptoms are hardly needs repetition here; they are well marked and many of the cases of associated skin and joint disease, joint disease associated with trophic disturbances of the skin and nails, œdema, and atrophy of the skin, etc., come under this heading. All these symptoms are no doubt due to chronic intoxication and its consequences, and there is no reason to believe that the joint symptoms are not due to the same causes.

Toxic substances of the kind under consideration seem rather capricious in their action upon the various tissues, and the organs predisposed to their action seem to vary considerably. In one case a certain set of organs is only slightly involved, and another set is markedly affected; while in another case the prominence of the affected organs is reversed. For this reason the joints are not always involved when there is chronic intoxication either endogenous or exogenous; nor are the concomitant symptoms always just exactly the same when the joints are markedly affected.

There are, no doubt, a number of varieties of endogenous intoxications, many of which are as yet imperfectly understood, and the multiplicity and lack of uniformity of the symptoms may be due to the fact that we are as yet unable to distinguish between the various forms of intoxications, as well as the diversity of their action upon the tissues.

As far as the joints are concerned, the symptoms seem to be fairly well defined and uniform no matter what the diversity of the other elements may be. At any rate, with the exception of the arteriosclerotic form and a mild form of arthritis which sometimes complicates diabetes mellitus, I have been able to separate only the one type of primary arthritis associated with general metabolic disturbance; nor to judge from the literature, has anyone else been able to find more than the type above mentioned.[1] It is probable, however, that as our knowledge of these conditions increases we

[1] It must be understood that I am speaking of primary arthritis, and that for the present I leave the joint lesions, which are subsequent to bone changes like those which sometimes occur with psoriasis, out of consideration.

shall be able to recognize and distinguish the joint lesions more specifically.

For the present we must content ourselves with being able to distinguish between only two forms of joint disease due to anomalies of the metabolism.

1. The osteosclerotic form of metabolic arthritis.
2. Metabolic arthritis probably due to autointoxication, the autotoxic form.[1]

If now we examine the types *a*, *b*, *c*, and *d* we find that though they differ as to details, they nevertheless have certain well-defined characteristics in common.

In the first place they are all ushered in by more or less acute general constitutional disturbance. This general constitutional disturbance is just exactly like that which marks the advent of nearly all acute infectious diseases; and when, as sometimes happens, the general symptoms precede the joint symptoms by a considerable interval, the differential diagnosis may become somewhat difficult. Pribrim speaks of such cases, and two cases of this kind have come to my own notice.

In one of them a man, aged thirty-three years, was taken ill quite suddenly with pains in the abdomen and back, headache and malaise. When I first saw him his temperature was 102°, pulse 90; physical examination negative. He continued to run temperature with irregular remissions and exacerbations for a week without the appearance of any more characteristic symptoms. At the end of this time he developed a systolic cardiac murmur and began to complain of pains in the joints. But the joints were not swollen until a number of days afterward. Both knees and the left wrist then began to swell (effusion) without marked redness or severe pain.

The subsequent course was that of a chronic deforming arthritis. The general symptoms subsided and the cardiac murmur diminished in intensity until it could hardly be detected. But the joint symptoms, though temporarily improved, never entirely disappeared. The swelling would disappear almost entirely for a time, but as soon as he began to use his limbs, or without apparent cause, the swelling reappeared. To-day, about four years after the onset of the disease, he occasionally has pain, the knees are quite stiff, and there is some limitation of motion in the wrist. The proliferated synovial fringes and thickened capsule can be easily felt by palpating the knee. He has slightly increased cardiac dulness and a faint systolic murmur.

No doubt this was a mild case of the so-called cryptogenetic sepsis. Here we had a cardiac involvement before joint involvement, and the joint symptoms were simply a part of the general infection.

[1] A third form which occurs with chronic bacterial toxæmia is for the present not considered.

In the more acute cases, with high temperature and early joint involvement, the latter symptoms may be very acute and the disease is often mistaken for acute rheumatism, which is later supposed to become chronic. But in these cases the sudden skipping from joint to joint which is so characteristic of acute rheumatism is absent, the joints once affected being almost always permanently damaged. Moreover, the general symptoms are sometimes very severe in this class of cases, and they are not infrequently attended by a fatal issue; no doubt the majority of the so-called fulminating cases of acute rheumatism belong in this category. Carefully analyzed, the symptoms in these cases can lead to no other conclusion than that these are cases of some virulent form of general infection. They differ only from the ordinary cases of cryptogenetic sepsis in the fact that there is here a somewhat greater tendency to recovery.

The joint symptoms, which always remain permanent when these patients recover, differ somewhat from those with a milder onset. Here the joints are contracted and deformed very early and the adhesions formed during or immediately after the acute stage are permanent, so that there are rarely remissions, but the contraction and consequent deformation goes on steadily for years and often becomes extreme.

The cases in type *d* have, besides the general signs of microbic infection, the swollen glands, as an additional proof of their infectious nature.

The onset in the types *a*, *b*, *c*, and *d* is, therefore, certainly that of an infectious disease.

In many of my cases the joint symptoms have been preceded by well-marked signs of infection elsewhere—*i. e.*, they acted exactly like the cases of chronic articular disease following the well-known infections, such as scarlet fever, pneumonia, gonorrhœa, etc. So, for instance, in a man of twenty-eight, during the course of a severe tonsillitis, the interphalangeal joints of the third and fourth fingers of the left hand, the right wrist and the right knee-joint became swollen and painful; urine and heart negative. The swelling in the knee and wrist have disappeared entirely, but the fingers have not as yet regained their normal mobility.

In another case, a boy, aged nineteen years, developed a swelling of the left knee a few days after the advent of a furuncle on the neck. A few days later (after the furuncle had been incised) the other knee became swollen, stiff, and painful. In the course of a few weeks, both ankles, the fourth finger of the left hand, and the right elbow became involved. All the joints have recovered except that of the fourth finger (interphalangeal joint), which is still swollen, deviated, and stiff; the thickened capsule can be readily made out by palpation.

The knees, ordinarily, show no signs of disease, but immediately swell and become painful upon slight exertion, and he has not for

this reason been able (eight months since the initial attack) to resume his occupation.

In still another case a woman, aged thirty-eight years, both knees became swollen, after an abortion with infection, and still continue to be stiff, swollen, and painful two years after the onset.

In these and a number of other cases which cannot be detailed here the disease followed so closely upon the evident infection, and the course pursued was so nearly analogous to that pursued by those joint diseases definitely known to be connected with infectious diseases, that there can hardly be a question as to the etiological connection.

I am of the opinion that were the bacteriological examination of the blood undertaken in these cases, particularly in those with a very acute onset and a sufficient period of general invasion, we should no doubt be able to find the evidence of microbic infection, both as to its presence and its character.

However, even those cases in which the blood examination proves negative could not be used to controvert the idea that they are due to general infection. The bacteria may not be present in the blood in sufficient numbers to enable the bacteriologist to discover them, or the general symptoms, and those of the joints may be due to a toxæmia from the activity of bacteria situated in some focus impossible to locate in the living subject. So much is certain, the very acute cases follow a course which is exactly analogous to the milder case of cryptogenetic sepsis, barring, of course, their lesser morbidity. It must be remembered that not a few cryptogenetic septicæmias run a mild if not a chronic course, and not infrequently only the bacteria in the blood or endocardial changes enable us to make the diagnosis; that, moreover, there are cases on record in which the pathogenic organism remained within the body long after the initial symptoms had disappeared, causing recrudescence of the whole symptom-complex of septicæmia, with, in one case at any rate, ultimately a fatal issue.

The cases of chronic arthritis with an acute or subacute onset, now under discussion, often pursue a similar course as to the general symptoms, as do the cases of general systemic infection. Some of the cases are ill for a considerable period before joint symptoms become manifest, which unquestionably speaks for a primary general infection. In some of the cases no doubt the initial symptoms are so mild that they are probably overlooked entirely, and the cases do not come under observation until after the joints have become perceptibly damaged. The majority of the cases, however, show marked symptoms of general invasion which precedes joint disturbance, and the great number of these have a recrudescence of the general infection with each exacerbation of the joint symptoms.

But in concluding that those cases of joint disease are analogous

to the general infective processes we do not necessarily infer that they are all caused by the same infective agent—on the contrary, this is true neither of the septicæmias nor of the infectious arthritis. Though we may safely affirm that these cases are all infectious, we cannot with any degree of certainty say which of the pathogenic microbes is causative until we have definitely isolated it in each individual case.

Thus, from their analogy to the septic pyæmic and other infective processes in their general symptoms, and from the analogy in the joint reaction to that which accompanies the well-known and easily recognized infectious diseases, we are enabled to definitely group the cases of so-called rheumatoid arthritis, here designated as type *a*, *b*, *c*, and *d*, with the infectious joint diseases; and we can without the least misgiving call them all cases of infectious polyarthritis.

The difficulty in the way of accepting infection as a cause in these cases, aside from the attempt to prove a single etiological factor for all the cases of so-called rheumatoid arthritis, seems to be due to the fact that most writers apparently consider the long-continued course, the remissions and exacerbations with, or particularly without, evident renewed constitutional disturbance, impossible of explanation in this way. If, however, we look into the general pathology of joint inflammation we find that this difficulty, at any rate, is illusory.

The joint membranes are said to react to all forms of deleterious influences in two distinct ways, either by an exudation or by proliferation. But if we examine many inflamed joints we find that these two forms of tissue reaction very rarely appear as distinct and isolated processes. For, unless the exudative inflammation is of a very mild type and early and complete restoration supervenes, it is always followed or accompanied by more or less proliferative change. Conversely the proliferative changes are rarely if ever present unattended by some joint exudation (effusion), and at least some of the capsule changes which accompany the exudative inflammations.

This accounts for the marked tendency displayed by all joint inflammations, no matter what their character, to become chronic. It is a well-known fact that a joint once the site of an effusion always remains more susceptible to deleterious influences. The capsule once injured seems to have lost the power to completely repair itself; so that when some of its elements have been destroyed, from no matter what cause, they are never completely regenerated, but instead, there is set up the stimulus to generate primitive connective tissue. This does not cease immediately upon the disappearance of the pathogenic element; but, depending more upon the degree than the kind of injury, continues for an indefinite period afterward.

For this reason when a large part of the joint capsule degenerates in a number of joints, as is the case in the very severe acute infectious

processes designated here as type *c*, the chances of restoration are practically *nil*. In place of the synovial membrane we have the formation of dense connective tissue, which goes on long after the exciting cause has disappeared, and the joint surfaces are gradually but surely bound together, until finally they are practically immovable. When these joints are examined late we find nothing but dense fibrous bands uniting the bony surfaces, and it is then, of course, useless to look for the exciting cause.

In the milder cases, which apparently run a subacute or chronic course, with remissions and exacerbations, it would seem that it were necessary to account for this course by the long-continued presence of the pathogenic agent. But, bearing in mind the peculiarity of the reaction of the joint tissues to morbid influences, they can be explained without assuming the continued presence of the morbid agent. Whether the inflammation has been due to direct bacterial invasion, to a general bacterial toxæmia, or to other causes, the course of the disease, after the initial acute symptoms have subsided, depends upon the degree of injury to the joint structures. Thus, if there has been a mild exudative inflammation, there is more or less noticeable tendency to recovery. But even in the mildest cases the joint remains weak for a considerable time.

Careful observers no doubt have noticed that in a large number of these cases, particularly in those with a mild initial attack, the patient seems to be quite well for some time after the subsidence of the acute symptoms. Moreover these particular individuals remain well so long as the joints are kept at rest for a considerable time. It is only when the joints are again brought into active use, soon after the pain and swelling have subsided, or after the usual strenuous massage cure begins, that the joint swelling and pain reappear.

This recrudescence of the pain and swelling is undoubtedly due to the too early use of the affected joint—*i. e.*, before the joint membranes are able to withstand the shock and irritation of ordinary functional use. In this particular class of cases the ultimate stiffness and deformation is not due to the original morbid agent, but to the recurrent inflammation as a result of the strain upon the weakened joint structures and the consequent increase of the stimulus to the formation of connective tissue, which follows all joint injuries or inflammation. Thus it is that the affected joints become progressively more stiff with each so-called exacerbation. That this is the true condition of affairs in a certain percentage of these cases of infectious polyarthritis is borne out by the fact that these patients, when properly and thoroughly treated by immobilization and rest until the original inflammation has disappeared entirely, or until the strong tendency to the progressive connective-tissue formation which marks the early stages has subsided, many of them recover the full use of the affected joints.

I have had a number of such examples under my own observation, any one of which demonstrates these facts conclusively. So, for instance, a young man, J. C., aged twenty-one years, after a few days of malaise, took to his bed in January, 1903, having pains in the back and both knees; temperature 101°. After a few days both knees became swollen and a few days later the left wrist and phalangeal joints of the third and fourth fingers of the right hand. The joints were all immobilized, the knees in plaster-of-Paris and the wrist and fingers with splints. The temperature continued for a week, when it came down gradually to the normal; but the joint swellings did not disappear until several weeks afterward. He was then to all appearances perfectly well; but he was, nevertheless, given a course of hot saline baths at home, and kept as quiet as possible for another three weeks. Then after a few weeks longer in the country, and appearing perfectly well, he was allowed to attend to his business. This he immediately did, but he was compelled to desist after a few weeks because the effusion and pain in the joints had returned. This readily subsided under appropriate treatment and he was advised to rest for at least six months. This he did, and from that time has had no further trouble.

However, though the exacerbations in some of these cases are unquestionably due to the irritation of the weakened or injured joint structures, we must, from the course pursued in others, conclude that the bacteria may remain latent for an indefinite period within the joint membranes and from one cause or another induce a recrudescence of the initial condition in the same joints originally affected, or by re-entering the circulation invade previously normal joints. These are the cases in which fever and general constitutional disturbance accompany the exacerbations, and those in which previously healthy joints are attacked at intervals. That there is a recrudescence of a previous infection is most graphically exhibited in those cases in which there is renewed general infection —*i. e.*, in those cases in which the bacteria re-enters the circulation. In these a recurrent attack may be accompanied by more severe constitutional symptoms than the initial one. Of course we cannot hope to demonstrate the infectious nature of these cases by actual demonstration of the micro-organisms in every case. The fact that the micro-organisms need not necessarily be in the joints themselves (recurrent bacterial toxæmia), that they are rarely present in the joint effusion in any case, and that, from the nature of the condition, we are not always in a position to search for them where they are situated, renders the invariable demonstration of their presence, for the time being, at any rate impossible.

However, the fact that joint affections now under discussion, present all the earmarks of a general infectious disease in the beginning, that there is nothing in their course which speaks against the infectious nature of the condition, but that on the contrary

the course can be best explained on such a basis; that, moreover, the condition not infrequently follows infectious processes, which are known to cause secondary infection, in other organs (nephritis, endocarditis following tonsillitis, etc.); and that the incidence of the joint infection is closely analogous to these; and that, furthermore, they have all the essential features in common with those joint affections in which well-recognized bacteria have been found (typhoid, gonorrhœa, etc.); all speak so decidedly for infection as the cause of these joint inflammations, that ocular demonstration, though desirable, hardly seems necessary.

There is no reason to suppose that all these cases are caused by the same pathogenic organism. On the contrary the differences in the onset, the subsequent course and minor symptoms, should rather incline us to believe that numerous and diverse micro-organisms are capable of causing similar morbid conditions in the joints, not so much because other organisms are alike or exactly analogous in their activities, but because the joint structures are limited in their reaction to irritation.

The analysis of joint disease, heretofore known as rheumatoid arthritis, here undertaken, has, I think, cleared up a number of mooted points as to their cause and their similarity with one another.

In the first place we are forced to the conclusion that these cases are representative of no single pathological entity, but, on the contrary, are examples of various distinct clinical and pathological conditions which often differ greatly from one another. We can divide them roughly into two great classes:

I. Metabolic joint diseases.
   (*a*) Arteriosclerotic form.
   (*b*) Autotoxic form.
II. Infectious polyarthritis.

This (II.) class comprises numerous and probably diverse forms of infection as in evidence by the onset and course. Thus we have the cases with very acute onset, severe general infection, and a large number of joints seriously and permanently damaged (type *c*). These are the cases which Pribrim designates secondary chronic rheumatoid arthritis. But they have not, as he thinks, a direct connection with true acute rheumatism, but, on the contrary, are apparently closely allied to the septic pyæmic processes. They are frequently complicated by visceral inflammation, particularly endocarditis. In 30 cases under my own observation 14 had endocarditis, 2 nephritis. Besides these there are the milder cases, *a* and *b*. The general infection is less severe but varies greatly; and this is probably due to the number, virulence, and variety of the invading micro-organisms. In some cases the general symptoms are so mild that they are probably overlooked altogether, while in others there is severe toxæmia or bacticæmia, evidenced

by marked constitutional reaction and visceral complication. The course after the subsidence of the general infection or the initial acute joint symptoms, depends, first, upon the damage to the affected joint; second, whether the affected joints are given sufficient time to recover before they are put in use; third, upon the continued presence of the invading organism.

Finally, we have in type *d* a distinct form of infectious polyarthritis in which the swollen glands are a characteristic symptom.

The above conclusions have been reached after a careful study of some 200 cases of which records have been kept, and of an indefinite number of which I did not take notes, but which were nevertheless carefully observed. In the short compass of a periodical paper it was not possible to go as exhaustively into the subject as would seem necessary to make my views clear or as such an extensive and complicated subject demands, still I hope that this rough outline will be sufficient to prove that there is no such thing as a distinct disease, rheumatoid arthritis, and that polyarthritis is a many-sided subject which still presents many unsolved problems, and which, if it is to be understood, must be studied from a broad and unbiased standpoint.

A CASE OF RHEUMATISM OF THE STOMACH, WITH INCIDENTAL HÆMATEMESES OF UNCERTAIN ORIGIN.

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That the various muscular structures of the body may become affected with rheumatism is a matter of common knowledge. That the stomach, as some other organs, may become affected in attacks of rheumatism involving other parts of the body is also well known. That the stomach alone should be so attacked, that it alone should be the seat of the ailment, has not yet been recorded, at least as far as my reading of medical literature has gone. It is for this reason that the following case, which came under my observation and which is certainly one of great interest, is here reported:

August 20, 1900. Joseph L., a resident of Chicago for over fifty years; aged sixty-seven years; man of large frame; six feet in height; weight 140 pounds (about fifteen years ago he weighed 180 pounds). He is not engaged in any business at present and has not been for the last ten years. Has not smoked for the last twenty years; gave it up on account of trouble with his stomach. Drinks no alcoholic liquors of any kind.

Says he has been troubled with dyspepsia for the last thirty years; suffers attacks of pain in his stomach, which come on usually about the fall of the year and continue off and on throughout the whole winter—*i. e.*, there are intervals of freedom from pain of longer or shorter duration. This continues until the summer season sets in; he then recovers quickly and continues well during the continuance of the hot weather.

At the outset the attacks were not so severe and the intervals of freedom longer. Later on the attacks became much more severe and compelled him to take to his bed. He consulted many physicians.

The diagnosis was dyspepsia and various dietary regimens, and many medicines were prescribed therefor. He took the cures at different springs, but was not in any way benefited. He was troubled so much that he retired from active business (merchant), and took to some lighter and less engrossing occupation; but, as the attacks grew more severe and laid him up for considerable periods at a time, he also gave this up.

He has always been troubled with bloating, a feeling of distention, with eructations. Latterly he does not belch so much, but feels more bloated. His appetite is poor, and has been so for a long time; has been a small eater during many years. Does not eat anything fried. His breakfast usually consists of one soft-boiled egg and a cup of milk; dinner, a small plate of thin soup and a small bit of boiled meat, chicken, or lamb (very rarely beef or veal); supper, milk and zwieback. He has always (since his trouble began) been afraid of the evening meal. He never drinks any water.

His bowels have been constipated as long as he can remember. He takes some form of purge—salts, pills, enemas—regularly. However, each and every remedy soon loses its effectiveness and he must resort to another. When his bowels move regularly, spontaneously, which may occur at long intervals and continue for a week, he feels better. For a year past he has suffered severely from cramps, the attacks coming on mostly in the night. He cannot say whether they are in his stomach or in his bowels. They seem to be all over his belly, but are felt most severely in the epigastrium. They travel upward and lodge there. He also has pains in the back, in the right lumbar region. *His pains become more severe when the weather is about to change.*

On May 19, 1900, his wife died rather suddenly, after an illness of but a few days' duration, and he was very much prostrated by the shock. A week later he had a hemorrhage, hæmatemesis (to what extent I could not learn; he himself was not in a condition to judge, neither were the other members of his family). His usual medical attendant found him so low that he gave him but a few hours to live. A well-known and eminent surgeon was at once summoned. Patient remained in bed for a month. Since then he

has been on a low diet—milk, shredded wheat biscuit, malted nuts, a little light broth and crackers.

Examination. Very spare in flesh. From Xc to U 10½ cm.; line of crease there. *Stomach.* Left thoracic region resonant from fifth rib; left epigastrium resonant to ninth rib; median line dull; right epigastrium, upper segment dull; lower, intestinal resonance; no sensitiveness anywhere; no splashing; water ℥vij; no splashing. Sound of water rushing out through pylorus distinctly heard. (He went to dinner after the examination; came back two hours later; splashing could now be distinctly heard.) *Liver, spleen,* normal in size and position. *Abdomen,* nothing abnormal to inspection or palpation. Right half of abdomen sonorous resonance; left half dull.

August 21st. Test breakfast (Ewald and Boas); one hour; tube introduced; obtained 100 c.c. stomach contents, bread and fluid; ordinary appearance. On standing settled in three layers; top layer a little mucus with some floculi of bread caught in it (the mucus was nasopharyngeal). Second layer, water; third layer, bread well worked up, part finely pulverized and part like fine grits. Reaction to blue litmus+. Reaction to Congo+. Reaction to phoro. glue. vanil+. Free HCl, 43; total acidity, 69; hyperpepsinia.[1]

As a tentative measure to determine exactly the cause or causes of the nightly attacks of cramps, I gave him a massage (abdominal) and directed him to take asafœtida, grs. x, at 9 P.M. If his bowels did not act to-day he was directed to take a pill of aloin, belladonna, and strychnine at bedtime, and if he had other pain than the cramps, to put a cold compress (Priessnitz) around abdomen.

To-morrow at 11 A.M. ordered to take a test meal of soup, noodles, meat (broiled chops or broiled steak), some stewed tomatoes (he was told to take some of the skin of the tomatoes, cut it into small pieces, and put them into his soup), and a piece of pie, and to be at the office at 5 P.M. sharp.

22*d.* At the appointed hour, namely, six hours after the ingestion of the test meal (one hour less than the time fixed by Leube for the ordinary digestion of his test meal) he was at the office. I gave him eight ounces of water and introduced the tube; nothing came out but a little scum, which under the microscope was seen to consist of some fat globules, some starch granules, and debris. A few small pieces of the tomato-skin were brought up and readily recognized by their color. The water gave reaction to blue litmus+, to Congo+, to phoro. glue. vanil.+; free HCl, 28.

The test meal did not cause him the least distress. He said that when his family saw him eat this meal, such as he had not eaten in many years (he had not tasted pie in fifteen years), they gazed at him in open wonder, and had rather serious misgivings as to the consequences thereof.

[1] Determined according to the method described by me in the Archiv f. Verdauungskrankheiten, Bd. x. Heft 2.

Yesterday evening he took the asafœtida as directed. He felt some slight pain as he was about to retire, put on the wet pack as directed, and slept soundly until the next morning, something he had not done in a very long time. His bowels moved this morning; he did not deem it sufficient, however, and took an aloin, belladonna, and strychnine pill.

Massage. Repeat the asafœtida at bedtime.

Diagnosis. The *stomach* is in excellent condition, both as to motor function and to chemismus. The *constipation* may perhaps have resulted from the bland character of the food, which has constituted his diet for many years. The *cramps* are due to the flatulence and possibly to the presence of some free HCl in the stomach. The *pains* which come on about the fall season, as described above, I hold to be *rheumatic.*

24*th.* When he came in to-day I gave him my diagnosis of his case, so that, being an intelligent gentleman, he might understand the purport of the various directions for his treatment. When I explained to him the nature of the pains he had so long suffered, he said to me that of all the physicians, eminent and otherwise, whom he had consulted, only one, and this one a country practitioner, had made the same diagnosis.

TREATMENT. An anticonstipation diet, otherwise the usual meals, such as most well persons ordinarily eat. The food to be so prepared as to be readily and easily digested; no salads, nothing prepared with vinegar or lemon, and no raw fruits. To drink at least four glasses of water—plain water—a day. The rules for the toilet.[1]

Medication. The asafœtida pills as above directed. To move his bowels a pill of aloin, belladonna, and strychnine as required.

For the pains coming on with the fall season he would have to change climate; get away from Chicago; go down to New Mexico or Arizona. For various reasons I advised him to try Albuquerque.

27*th.* Up to day before yesterday his nights were almost altogether free from pain; that night, however, he had again a slight reminder thereof, but it soon passed. His bowels are open daily (he takes the aloin, belladonna, and strychnine pill almost daily), but his stools are thin and watery. (Possibly the pill is too strong.)

In making the massage, in the movement for the small intestines,[2] I noticed some splashing as they were agitated up and down. (He had taken his lunch about an hour ago, and a glass of water shortly before he came in.) The splashing was heard about U.

Take a nux vomica tablet, āā ɱj, q. i. d.; continue the asafœtida for the present; take a glass of Vichy (Celestins) before retiring.

30*th.* Getting on fairly well. Monday night some pain, likewise on Tuesday night. Bowels open; stool not so thin as before. He has noticed that when he passes flatus per rectum his pains (in the

[1] Illoway. Constipation in Adults and Children, etc. [2] Ibid.

abdomen) are very much relieved. Take a Lady Webster pill at bedtime, and lac asafœtidæ, ℥j, whenever the pain is felt.

September 5th. Complains much of pain in the back. Galvanization up to 15 M. A. Continue otherwise as before.

6*th.* Yesterday, after treatment, he was free from pain until 8 P.M., when he again felt some distress in his bowels. Took lac asafœtidæ and was quickly relieved. Repeated galvanization; gave him some cimicifuga tablets. He eats the ordinary food and feels altogether much better now than he has in many years. Takes the Lady Webster pill; his stools are formed.

7*th.* Much better; almost free from pain. Felt a slight twinge in his bowels last night, but the lac asafœtidæ quickly relieved it and he slept very well. On the whole, he sleeps very well now. Repeated galvanization; massage of abdomen; continue cimicifuga tablets.

Now that the abdominal walls are accustomed to the touch and do not contract under it, *splashing* of stomach is plainly noted.

14*th.* Has been doing very well. He has not required the asafœtida any more and has slept well. He sleeps well, better than he has for three months. Eats everything that comes along—corn on the cob, corn-cakes, table d'hôte dinners in restaurants. Advised him to take syrup with his corn-cakes. Galvanization anteriorly and posteriorly; cannot stand as much as before, not more than 6 M. A.

18*th.* Continues to do well. Bowels regular; has not required any pill since five days. Has not had any pains (anywhere). Even the remarkable changes in the weather did not affect him. Massage; galvanization; continue the cimicifuga tablets.

October 1st. Reported that he was feeling very well; no pain since last note; eats everything, except things prepared with lemon or vinegar. Asked if he could eat some raw fruit; was told to begin with a mellow peach, a plum, or California grapes.

22*d.* The weather has been raw and cold for the last few days. He has the pains again in his back and somewhat in his stomach. Galvanization; take salol, grs. xv bis die, and come in to-morrow for repetition of electrical application. He is going back to Chicago in a few days. Advised him to stop at Hot Springs, Va., and to try the baths there, and to make his stay in Chicago as short as possible.

23*d.* He took the salol and is feeling much better. He slept so well last night that he was afraid to take any more of the powders, under the impression that they contained morphine. Continue salol, grs. x bis die; galvanization.

28*th.* Getting along very well, only now and then the pains in the back. Continue the salol. He leaves here to-day.

December 4th. He wrote me from Hot Springs, Va., that he had already taken fourteen baths, but is in no way benefited. His pains are as bad as they were ever before. Advised him to go home,

arrange his affairs as quickly as possible and go South, meanwhile to take salol, ℈j bis die, and the fluid extract of cimicifuga, beginning with gtt. v t. i. d., gradually increasing the dose.

January 2, 1901. Received a letter from the son, from Chicago, saying that his father is laid up with the pains. What should he do? Replied that he should get away at once, as I had directed him.

After some more correspondence, which took another week or ten days, Mr. L. finally got away. He was hardly two hours out from Chicago when he felt himself a new man. His pains were gone, as if by magic. He passed the rest of the winter at Albuquerque most pleasantly, absolutely free from all aches or pains and feeling strong and hearty. He returned to New York about the middle of May, looking ten years younger, rugged, and well rounded out. He remained about there, in a pleasant resort on Long Island, the whole summer and felt splendid all the time. He is eating such meals as he had not ventured upon for the last thirty years.

In the fall I saw him again, socially, and advised him to return to Albuquerque before the cold and rough winds set in here.

He left here December 15th. He had not had an ache or a pain since he left Chicago last January.

June 1, 1902. He came in to-day on a friendly visit. He had returned from Albuquerque about ten days ago. Said he had passed a very agreeable winter, free from all pain. Had been out and about all the time, and had even taken horseback exercise at frequent intervals. He looked well and hearty.

December 13th, 9 A.M. Was called to see him this morning. He had been feeling splendidly all the time, so well in every respect that at the rather pressing suggestions of his family he had concluded to stay in New York over the winter. Last Thursday night, the 11th, his daughters had persuaded him to escort them to a ball. It was a stormy night. It rained, and the water froze as soon as it touched the ground. It was also foggy and raw. He remained at the ball until 1 A.M.—much beyond his usual bedtime. While there he drank about half of a small glass of beer, which he said was bad. I could not make certain from his answers and those of his daughters whether he had eaten anything or not at the time. The next morning, the 12th, he woke up very much nauseated. He remained in bed part of the day. Later on he got up, took some milk, etc. This morning, the 13th, he again woke up nauseated, vomited several times; the last time vomited some blood—his daughter said it was a pint.

Directed bismuth subnitrate, grs. x, with soda bicarbonate, grs. ij bi hora, but nothing in the shape of food or drink. For the thirst, ice pellets. If any further hemorrhages, put ice-bag on stomach.

6 P.M. Says he feels better; sleeps much; is very weak; pulse barely perceptible. Ordered a teaspoonful of a mixture of equal parts of lime-water and milk every hour.

14*th*. Is doing well. Has had no pain and has none now in epigastrium; no tenderness there to pressure (of course, it was very light, for fear of causing damage). Is still drowsy; groans much, but when asked why he does so, says it is his weakness. Continue on as before; increase milk and lime-water āā to one-half cup every two hours.

15*th*. Getting along well; bowels moved by enema; strychnine sulphate, gr. $\frac{1}{100}$ every four hours; otherwise continue as before.

16*th*. Doing well, feels a little stronger. Ordered a teacupful of milk with one ounce of lime-water and a pinch of salt every two hours. Strychnine sulphate, gr. $\frac{1}{50}$ every four hours. The powders every three hours.

17*th*. Says he is very hungry, wants to eat. Allowed chicken, soup, coffee with milk, boiled rice (dry). Powders every four hours. Continue strychnine.

10 P.M. Called to see him. He complains of great pain in chest, on both sides, along upper border of liver. He thought it was due to the rice he had eaten, which he believed was not properly cooked. (Might also be the old rheumatic pain.) Has already taken two enemas. To put a sinapism over the epigastrium and girdle around with it. Give one and a half teaspoonfuls of maltine to digest the rice, if any still remained in his stomach, and repeat the dose in two hours. If the pain is not relieved by 12.30 A.M. give morphine sulphate, gr. $\frac{1}{4}$, and, if necessary, repeat $\frac{1}{8}$ in three-quarters of an hour.

18*th*. For some reason or other the directions as to the morphine were not followed, and it was not given until 6 A.M., consequently he had rather a restless night. He feels very good now. His pulse is much better and he feels stronger; wants to eat. To give him the diet directed above and, in addition, a wineglassful of Hoff's malt t. i. d.

23*d*. Doing nicely; allowed to eat everything; is troubled by his old rheumatic pain. Take salol, grs. xv, occasionally.

29*th*. He has been doing well in so far as his stomach as a digestive organ is concerned; but he has been troubled rather much by the rheumatic pain about it. He leaves for the Southwest to-day. He ate his dinner and made a very good meal.

His son-in-law accompanied him as far as Chicago. On his return a few weeks later, he reported that they had been out from New York but a few hours, when the patient's rheumatic pains were gone and he was himself again.

June 10, 1903. Saw him to-day. He said he had passed a fairly good winter at Albuquerque, though not as good as the winters previous. The weather had been rather chilly and there had been some cold winds that caused a return, though only in slight degree, of his pains. In March he had made a wagon trip of about one hundred miles to the hot springs, and enjoyed it very much. He was feeling very good now.

September 17th. Was called to see him; found him in bed. The past summer was a decidedly cool one. June was cold. Since the beginning of the month very cool weather has set in; it is very windy. Mr. L. has felt this raw, stormy weather very much; his pains have come back and he is much troubled thereby. He is weak and feels weak. Pulse 64, rather weak; no temperature. Ordered salol, grs. xv, at bedtime and strychnine sulphate, gr. $\frac{1}{100}$ ter hora. Eat light diet—milk, oatmeal, coffee, eggs, broths, etc. To try and get away from New York as quickly as possible; to go to Los Angeles. As his room was decidedly cold, I directed that it be heated.

20th. The pains continue. Prescribed a pill of guaiacum, cimicifuga, and colchicum, to be taken t. i. d. Continue the strychnine.

24th. His stomach would not tolerate the pill, and he had to discontinue it. Strychnine appears to do him the most good. For the pains he was directed to take salol t. i. d.

28th. He called at the office to-day to bid me good-bye, as he was leaving for the warmer country. I repeated my advice that he go to Los Angeles, or, if he could not do that (and he seemed rather disinclined to go so far), to go down to El Paso or San Antonio, Texas, and to stay at either of these places until the first of April and then go to Albuquerque for the balance of his visit.

January 5, 1904. Heard from his son to-day. The old gentleman, instead of following my advice, had gone back to Albuquerque. For six weeks he had been fairly comfortable, though not as much so as in the previous years. His accommodations were not as good, and the weather was much cooler than usual; it was decidedly windy. They had had snow there for the first time in many years (they closed the schools so that the children could see and enjoy it). In fact, he had not been entirely free from pain. After the time named his pains became worse, and he is now under treatment with an osteopath,who is rubbing and beating him according to their formula.

January 15th. The son-in-law called on me to-day in regard to the patient. He has had several hemorrhages from the stomach and is very weak. I advised that the best physicians of the place be at once summoned.

20th. Heard again to-day that the hemorrhages continued. They came on at first slight and then gradually increased in severity. He would have two or three a day for two to three consecutive days, and then they would stop altogether for a few days, only to recur again and more violently.

24th. He died January 21st.

I regret very much that it was impossible to have a postmortem examination. It would certainly have been of greatest interest to inspect his stomach, and to have an ocular demonstration of its condition.

As this history clearly shows, this was not a case of rheumatism of the abdominal muscles. These were not at all involved. There

was no tenderness about them, not even sensitiveness. The patient did not make the least complaint concerning them. In brief, they were in normal condition.

The reasons for classifying this case as one of rheumatism are also very apparent. The stomach, in so far as its chemismus and motor function were concerned, was, at least at the time of my examination, in an excellent state. Its digestive capacity, as disclosed by the meals he was able to take while under observation with me, was above the average. Nothing about it that a physical examination could disclose was abnormal. It was only at a certain period of the year, with the setting in of cold weather, especially the stormy winds, that the pain set in. Even then the epigastrium was not especially sensitive. The symptom was almost altogether (except for the general depression and the expression of the face, indicating suffering) a subjective one. There was no fever. As by reason of the pain he did not take his usual meals, he partook of light foods, such as milk, milk with coffee, soups (farina, oatmeal, barley), a soft-boiled egg, sponge cake, cracker, with fair relish and at sufficiently frequent intervals to nourish.

In this its main feature—that is, the one upon which the diagnosis was based, the appearance of the pain with the setting in of the cold, sharp winds of autumn, earlier, if they appeared early, and later, if they set in late—the ailment of the patient presented what already Sydenham had written as one of the characteristics of rheumatism, a fact unquestioned even by the most recent authorities. In truth, I have for many years laid it down for myself as a rule of practice that all aches or pains dependent upon atmospheric changes, or to which change of season stood in the relation of an etiological factor, should be regarded as rheumatic and treated accordingly.

Moreover, the relief experienced so quickly on withdrawal from the atmosphere of Chicago and New York, as related in the history, and the freedom from pain afforded by a sojourn in a warm climate is additional, and I believe striking, proof of the correctness of the diagnosis.

That he was not benefited the last time was because Albuquerque was too cold for him that year, as already related in the history. In fact it had already been too cold the year before, and he had not benefited by the change as much as he had the two winters previous to that. It was for this reason that I advised him (in the fall of 1903), as noted above, not to go to Albuquerque this time, but to Los Angeles, or at least to El Paso, much farther south and therefore much warmer than Albuquerque; but he did not heed the advice.

> There's a divinity that shapes our ends,
> Roughhew them how we will.

The only perplexing feature in the case are the hemorrhages. In the absence of a postmortem examination, which would have cleared up this point, we can account for them in one of two ways:

1. It is possible that already previous to the first attack, and long before it, the stomach secreted large quantities of HCl, and that, owing to the light diet on which the patient lived, a considerable quantity of free HCl always remained over in the stomach after the expulsion of the chymus (see the record of the examination with test meal) and bathed the mucous membrane; that when in consequence of the shock caused by the death of his wife the vitality of the system was very much depressed, the resisting power of the gastric mucous membrane being correspondingly lowered, it became eroded and the hæmatemesis followed.

But how account for the second hemorrhage? Here no such factors were present. Indeed, the patient was feeling very well at the time, and had felt so for some time previous, else he would certainly not have gone to the ball. Again the next day when I saw him there was no pain in and no sensitiveness about the epigastrium; in fact, nothing objective.

As to the third and last and fatal hemorrhages there is no question in my mind that they were the result of traumatism, produced by the pounding and beating and stretching he received as treatment from a disciple of osteopathy. Given a tendency to hæmatemesis and such treatment will be certain to make a flow impossible of arrest.

2. This latter I hold to be the true explanation.

The hemorrhages did not come from the stomach at all, but from a network of varicose veins, varices, situated in the lower segment of the œsophagus, near the cardia—the point at which they are most usually found.

It is not necessary to go into any discussion here of this condition, as varices of the œsophagus are now well known, quite a number of cases, and that more recent ones, being already recorded.

With this latter explanation all the phenomena concerned with this feature of the case are fully accounted for.

AN EXTRAORDINARY CASE OF ANTHRACOSIS SIMULATING THORACIC ANEURYSM.[1]

By Henry Sewall, Ph.D., M.D.,
of Denver, Col.

The following case is of interest from the standpoint of pathological anatomy, *x*-ray diagnosis, and cardiac physiology. The patient suffered from a mild degree of pulmonary tuberculosis. He was referred to me in April, 1904, by Dr. William Duffield, of Phœnix,

[1] Read before the American Climatological Association, June, 1905.

Arizona, on account of a systolic *bruit* confined to an area represented by the lower half of the right scapula when the shoulders were thrown back. The *bruit* was suspected to arise from a thoracic aneurysm. My first explanation of the murmur referred it to "fluid veins," probably caused by pressure of adhesive bands upon a branch of the pulmonary artery. Later developments convinced me of the existence of an aneurysm, which opinion was held up to the time of autopsy.

History. May 4, 1904. Mr. J. D., aged forty-six years; single; machinist by occupation. When about twenty years old he worked for over a year in the anthracite coal region of Pennsylvania, and in "very bad air." Has lived in Tacoma, Washington, fourteen years. Parents dead; father at sixty-eight years, mother at seventy-two years. No lung trouble in immediate family. Had gonorrhœa about ten years ago. Had sores on penis six or seven years ago, and later had bubo excised. Had no antisyphilitic treatment. Never had rheumatism except severe lumbar pain six or seven years ago. Otherwise patient was well until about five years ago, when he noticed that he became breathless on exertion. Had no swelling of feet. Dypsnœa, with exertion, increased, so that it distressed him very much. About December, 1903, he caught a severe cold, which kept returning. Sputum examined showed presence of tubercle bacilli. He went to Phœnix, Arizona, about January, 1904. He was very ill for a while, suffering from severe sharp pains through the whole chest, back and front, on lying down; pains disappeared on sitting up. He then improved until April, when his breathing on exertion became progressively more difficult. He can sleep only on left side; cannot breathe well lying on back or right side. Appetite good; bowels regular. He had been operated on for *fistula in ano*, in Phœnix.

Physical Examinations. The first examination was made in mid April and the results are recorded from memory. The patient then presented evidence of a moderate degree of consolidation at the right apex; consolidation very slightly indicated on the left. Between the backbone and lower half of right scapula was heard a systolic murmur, gradually increasing in intensity during inspiratory movement and failing in expiration, and gradually disappearing completely when the breath was held in inspiration. The patient felt quite well except for some shortness of breath. He returned after some three days, complaining of headache, backache, boneache, and dyspnœa. The temperature was normal, spleen slightly palpable, the pulse was very rapid, and the heart had a pronounced gallop rhythm. He was sent to bed at once in the hospital. The next morning the gallop rhythm had disappeared, but the first sound of the heart was remarkably doubled. After a week's rest in bed the following notes were made of the patient's physical condition: May 4, 1904. Weight in health, 154 pounds; present weight, 145¼ pounds. Height 5 feet 10½

inches. In sitting position the area of heart dulness is a flattened half oval reaching from the liver dulness on right parasternal line to the fifth left cartilage on a line about one-quarter of an inch left of left nipple. The apex beat is diffuse, but can be felt in the sixth interspace a little left of the parasternal line. Radial pulse full and rather dicrotic. Pulse rate, sitting, 108. The first sound of the heart is remarkably doubled at apex and along septum between the ventricles. On holding the breath the first sound becomes loud and humming; on a former examination a sonorous systolic murmur developed with held inspiration. Along the lower left border of sternum and on the left border of the left ventricle the first sound is *scrapy*. The aortic second is rather ringing in character. In the reclining position the apex pulsation is plain in fifth left interspace parasternal line, and there is a very limited pulsation, outward in systole, in the fifth right interspace just right of the parasternal line. The reduplication of the first sound is more and the scrapy murmur less marked than in the sitting position; also the aortic sound is less accentuated. There is no murmur in the area of pulsation right of the sternum. The epigastric pulsation retracts at systole. The liver flatness in right nipple line reaches the sixth costal interspace. There are no moist sounds in lungs, but the breath note is restrained and a few sibilant rales are heard throughout both lungs. A few dry inspiratory crackles are heard at both apices behind, with high expiration, especially on the right. On the right back, in an area extending three and one-half inches to right of spine and with its lower border one and one-half inches above angle of scapula and its upper border about on the level of the spine of scapula, is an area of marked percussion dulness and greatly diminished breath sounds. Most marked about at the centre of this area of dulness, and gradually fading away as we recede from it, is a plainly heard systolic *bruit*, which increases in intensity with inspiration and gradually fades away with expiration. It soon disappears with held inspiration, but is maintained with breath held in expiration.

X-ray Radioscopic Examination by Dr. S. B. Childs, May 5, 1904.

The apex of heart seems to be about in left nipple line. The right border of heart is lost in the sternal shadow. Heart is low in the chest. The shadow of aorta in middle line seems broader than usual. The left lung is fairly clear. Both sides of diaphragm move fairly well, the left more than the right. Seen best from behind, projecting into the right lung, is a rather dense shadow, somewhat rectangular in shape. It fuses on the inside with the shadow of the base of the heart and ascending aorta, and a clear space remains between its outer boundary and the side wall of the chest. There is a narrow clear space above and a broad one below the shadow. No pulsation is seen in this shadow and it does not move with

respiration. Dr. Childs finds it of uneven density, and concludes that it is not an aneurysm.

Another radioscopic examination was made and radiograph taken by Dr. Childs on November 21, 1904. Through the radioscope the shadow of the body under consideration was apparently less quadrilateral in shape, pointing somewhat downward and

Case of J. D. The anthracoid mass in the right lung seen from behind. The circles, *O*, are on the periphery of the mass; the cross, *X*, is placed on the lower extremity of the right scapula.

outward in direction of the diffusion of the murmur described below. The shadow on the right is fairly well shown in the accompanying radiograph, as well as shadows of the black, hard bodies scattered through the lung below it.

Clinical History. In view of the venereal history of the patient, his circulatory disturbance on exertion, the arterial *bruit*, and the radioscopic findings, I concluded that he suffered from a peculiar saccular aneurysm of the aorta, and placed him in bed on a moderately light diet and a dosage of iodide of potassium, ranging from 5 to 15 grains, an hour after each meal. He remained in bed more than six months. The iodide was intermitted for several weeks, during two sharp attacks of cystitis. The patient felt perfectly well most of the time, though he frequently suffered severe pain, radiating from the stomach. This symptom, as well as the cystitis, was probably connected with the administration of iodide. At the time it was thought to be evidence of crises of locomotor ataxia. Knee-jerks could not be elicited and the pupil (one eye had been destroyed by injury while engaged in his trade) reacted sluggishly to light. He stood and walked well with eyes closed. The arterial blood pressure, estimated by use of the Stanton instrument connected with the arm, averaged during intermission of iodide of potash, systolic, 125 mm.; diastolic, 100 mm. During administration of iodide, systolic, 110 mm.; diastolic, 85 mm. For a time rest in bed was followed by diminution in intensity of the murmur in the right back, but later the loudness of the bruit increased; the sound, as well as the percussion dulness, extended downward and to the right. The sputum examined now and then occasionally showed the presence of a few tubercle bacilli, though these were not found at the last inspection. After approximately six months of nearly constant sojourn in bed the patient decided to go to California, but it was arranged to first take a radiograph of his chest. Accordingly on November 21st he was driven in a carriage to the office of Dr. Childs, where the studies detailed above were carried out. It was later learned that the patient, of his own accord, did a round of shopping in the business part of the city the same evening and came back to the hospital thoroughly tired. He passed the night as usual and rose and dressed in the morning, but soon complained of feeling ill and was taken with a chill which lasted about three hours, the temperature rising to 103.6°. He coughed up some bright blood and complained of intense pain over the heart, greatly aggravated by inspiration. He was given hypodermic injections of morphine and nitroglycerin. I was not able to see him for several hours, and then found him semiconscious, bathed in sweat, and nearly collapsed, pulse feeble and cheeks puffed out at expiration; slight pulsation was seen in the second right interspace. Some dry friction sounds were heard over the lower right lung and bronchial rales over the left. He remained in this condition, evidently understanding and sometimes answering questions, for more than twenty-four hours, when he died. There was no sign of paralysis. These events were taken as evidence that an aneurysm had ruptured by dissection, the blood probably penetrating the pericardial cavity.

Autopsy performed seventeen hours after death.

Postmortem rigidity very well marked. Chest opened, the right lung partly covers the heart. The pericardium opened contains no excess of fluid and no blood. The heart is large and the right side much distended with dark blood. The right ventricle shows a number of ecchymoses on its anterior surface. The right ventricle is much dilated and rather considerably hypertrophied. The left ventricle is not hypertrophied. Heart valves are all normal and competent. The aorta and pulmonary artery are normal. No sign of aneurysm is found. The *right lung* is free except for old, long adhesions at the apex. The visceral pleura has lost its glaze, accounting for the friction rub heard before death. The middle lobe is fused with the upper and lower lobes and cannot be distinguished except by clefts on the anterior margins. At the root of the right lung is found a hard, solid mass, ovoidal or pyriform in shape, measuring four inches long, from above downward, three and one-fourth inches wide, and two and one-half inches deep. The more pointed pole of the mass is directed downward, and below it is scattered a number of black nodules about the size of a grain of wheat, reaching to within two and one-half inches of the base of the lung. The mass described reaches the posterior surface of the lung. Immediately in front of the mass and pressed upon by it lie the right pulmonary artery and right bronchus. Hard, black nodules, about the size of duck shot, are scattered through the upper lobe. The apex of the lung for a distance of two inches from the border is bladder-like, with emphysema. On section of the mass at the root of the lung it is found to be black in color and gristly in resistance. Along its anterior surface the black substance is soft and pultaceous. The mass is fused with the lung substance, but is distinct from it and is not surrounded by a capsule.

The *left lung* is composed of three distinct lobes—a large lower lobe, a middle lobe nearly as large as the normal middle lobe of the right lung, and a somewhat larger upper lobe. The free margin of the latter is markedly emphysematous for a depth of one or two inches from the margin. As in the right lung, there is a hard mass at the root of the left lung immediately posterior to the left bronchus and left pulmonary artery. The mass is separated from these vessels by a small amount of soft tissue. The mass is in two portions, separately movable. The upper and larger moiety reaches the posterior surface of the lung. It measures two and one-half inches long by two inches wide by one and one-half inches deep. The lower mass is about two-thirds the size of the upper and is irregular in shape. Numerous small black bodies, the size of grains of wheat, are scattered throughout the lung. On section the mass in the left lung is found similar to that in the right. This mass was no doubt largely obscured by the heart in the *x*-ray picture. *Abdomen.* Intestines normal, but distended with gas. Stomach normal. The

appendix is coiled down under the cæcum, is closely adherent, and has a constriction near the free end. The liver is normal in size, not nutmeg, but pale on section, and blood exudes. Kidneys are normal. The mucous membrane of the bladder is marked by areas of ecchymoses and the viscus contained a drachm or two of pus.

Report of Pathologist, Dr. J. A. Wilder.

Gross Appearance. Both lungs are quite voluminous. Numerous large emphysematous bullæ are present along the anterior borders of each. The lower lobes crepitate freely on pressure; the upper lobes moderately. Both lungs float in water; the upper lobe of the right lung being submerged, however, and the upper lobe of the left lung partially submerged. The pleura is thickened and torn at the apex of the right lung, this condition extending about 10 cm. down the axillary surface. The pleura is thickened also at the apex of the left lung. Both pleuræ are diffusely mottled with black pigment, the pigmentation being more intense over the upper than the lower lobes.

On cutting into the right lung a large irregularly oval, grayish-black mass is encountered that occupies the apex and a large part of the upper lobe, dorsad to the bronchus and vessels at the root of the lung. This mass is cut with considerable difficulty, being very hard and dense. It measures 10 cm. in the anteroposterior diameters. At the periphery of this mass, and scattered also through the greater part of the lower lobes numerous black and grayish nodules measuring from 0.3 to 0.5 cm. in diameter are seen. Some of these nodules have caseous centres; others, particularly those most deeply pigmented, are hard and fibrous. The base of the lung is comparatively free from nodules, but is considerably pigmented, and appears moderately congested and œdematous. The left lung is similar to the right in all respects. It contains a large, black, dense mass in the upper lobe dorsad to the vessels and the bronchus at the root of the lung. This mass has about the same appearance and consistency as that in the right lung, but is smaller in size, measuring 7 cm. in its anteroposterior diameter. A few of the smaller nodules similar to those found in the right lung are seen around the periphery of this mass, most of them being deeply pigmented. The lower lobe is diffusely stained with black pigment and contains a few small nodules. It appears moderately congested and œdematous.

Microscopic Examination. Sections were cut from blocks taken from the centre of the mass and from the periphery of the mass in the right lung, from tissue including the small nodules in the right lung, from the base of the right lung, not including nodules, and from the corresponding parts of the left lung. Sections from the

centre of the masses from both lungs have the same general anatomical structure—viz., dense adult fibrous tissue with masses of black pigment scattered irregularly through it. In some places the pigment is present in large irregular blotches; in other fields it is more sparse. It is particularly noticeable in the connective tissue around the bloodvessels and bronchi. The greater part of the pigment appears to be extracellular. The bloodvessels appear dilated and are filled with red corpuscles. In some fields considerable round-celled infiltration is seen, these areas containing only a small amount of pigment when compared with the denser tissue. In sections taken from the periphery of the large masses no sharp line of demarcation can be seen between the dense pigmented connective tissue of one side of the sections and the air vesicles on the other, the former appearing to encroach on the latter gradually.

The alveolar walls are thickened and an abundant round-celled infiltration is seen in the alveoli themselves. Sections made through the lung tissue including the smaller nodules show considerable pigment in the connective tissue of the alveolar walls and around the bloodvessels, the connective tissue being very much increased in amount in these locations. The bloodvessels, as in sections from other parts, appear dilated and are filled with red corpuscles. The alveoli contain an exudate consisting of polymorphonuclear leukocytes, some red corpuscles, and epithelial cells, and a small amount of fibrin. The nodules themselves are of two classes. One variety has the general structure of tubercle—*i. e.*, a caseous centre that takes the stain poorly and is surrounded by an irregular zone of lymphoid cells and fibroblasts, some of them having typical giant cells at their periphery. These nodules do not, as a rule, contain much pigment. The other variety has a lamellated appearance and consists of fibres of dense connective tissue and a large amount of black pigment concentrically arranged. In the centre of some of these nodules a small bloodvessel filled with corpuscles is seen. In others a small opening containing cellular material suggestive of epithelium that has been subjected to pressure may be seen, the opening being perhaps the lumen of a small bronchiole. Some of the nodules show no central openings. In sections from the bases of the lungs the capillaries and larger vessels are engorged with blood; the connective tissue around the bloodvessels and in the alveolar walls is increased and contains a moderate amount of black pigment. The alveoli contain a considerable amount of exudate that consists of leukocytes, a few red corpuscles, and desquamated epithelial cells.

Anatomical and Histological Diagnosis. Old pleuritis, pneumonoconiosis, emphysema, pulmonary tuberculosis, alveolar catarrh, hypostatic congestion.

Dr. W. D. Engle, Professor of Chemistry in the University of

Denver, kindly submitted the pigmented masses to chemical analysis, with the following results:

Portion insoluble in hot caustic soda	62.14 per cent.
" " in fuming nitric acid	61.74 "
Ash of air-dried tissue	5.18 "
Ash figured on insoluble matter	8.33 "
Ash determined in insoluble matter	8.05 "

The ash has the following composition:

Silica	40.26 per cent.
Aluminum oxide	35.3 "
Ferric "	7.8 "
Calcium "	4.6 "
Magnesium "	2.2 "
Undetermined	9.84 "

"The analysis shows plainly to me that the material is coal-dust."

SUMMARY AND CONCLUSIONS. 1. The diagnosis of aortic aneurysm in this case was, perhaps, excusable, in view of the suspicion of syphilitic infection, the physical signs, and especially the disastrous effects of physical exertion. A careful survey of the radiographic shadow of the tumor in the right lung led Dr. Childs, however, to conclude that it was not due to aneurysm. Moreover, the failure of the therapeutic test with KI should have later caused revision of the diagnosis.

2. The chemical analysis of the pigmented masses leaves no reasonable doubt that the pigment was introduced from without and was not autogenous; that it was, in fact, coal-dust. Whether the hyperplasia of connective tissue making up the tumor masses was due to irritation of foreign material, a true anthracosis, or a peculiar fibroid change resulting from tuberculosis, with secondary deposit of pigment, cannot, perhaps, be definitely decided; the former view is much more probable.

3. It can hardly be doubted that the patient's dyspnœa and circulatory disturbance following prolonged exertion of even the gentlest character were due simply to pressure upon the two divisions of the pulmonary artery, and probably upon the main bronchi as well. The extra demands of physical exertion upon the right ventricle caused overdistension and, finally, paralysis of this chamber when its increased output of blood met the obstruction offered by the fibrous tumors.

4. The *bruit* heard in the patient's back was obviously caused by "fluid veins" generated by pressure of the fibrous mass upon the pulmonary artery. The location of the bruit, as well as the post-mortem findings, indicates that this obstruction was confined chiefly or wholly to the right branch of the pulmonary artery.

5. This case furnishes, apparently, a clinical demonstration of the cause of reduplication of the first sound and of the "gallop rhythm" of the heart beat. When through physical exertion the

patient's circulatory disturbance became profound the cardiac action gave rise to a marked gallop rhythm, and when the excitement was allayed by a few hours' rest in bed the triple "gallop rhythm" was succeeded by a simple reduplication of the first sound, which was gradually replaced by the normal heart beat. It can hardly be doubted that the cardiac distress was due to overdistention of the right side of the heart arising from the relative blocking of its outlet by the fibrous masses found postmortem, and that the ventricular systoles were thereby separated in time to a degree indicated by the abnormal rhythm of their sounds. This conclusion is an interesting addition to the facts in regard to the relation of gallop rhythm and reduplication already discussed by the author in another place.*

6. The extraordinary degree of emphysema involving the margins of the lungs finds a satisfactory explanation, if we admit a heightened intra-alveolar tension in expiration resulting from pressure on the main bronchi.

7. The chill, high temperature, and collapse of the patient on the day following relatively excessive exercise were probably due primarily to heart strain, though a part may have been played by intoxication from the mild grade of bronchopneumonia, found by microscopic examination of the lungs, which may possibly have been overwhelming to the shocked and defenceless organism.

ENTERIC AND MESENTERIC CYSTS, WITH REPORT OF AN UNUSUAL CASE.†

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of New York,

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Cystic tumors occupying the lumen of the intestinal canal are of such rare occurrence as to make them of pathological interest rather than of surgical importance; yet the possible origin of certain of these cysts would seem to classify them with other tumors similar in character, but different in location, which, from their comparative frequency, render them of practical importance to the surgeon.

Rokitansky[58] says that even in the vast amount of pathological material he has seen at the Vienna General Hospital cysts of the intestinal wall are great rarèties.

* On the Clinical Relations of the Papillary Muscles of the Heart, Philadelphia Monthly Medical Journal, September, 1899.

† Read in part before the Surgical Section of the New York Academy of Medicine, October 4 1905.

After a fairly careful search in the literature of intestinal tumors I have been able to find a description of but one case at all resembling my own, given below, and that only in certain particulars.

History of patient and description of the operation and of the cyst. January 7, 1905; Bellevue Hospital (service of Dr. Chetwood). J. K., male, aged twenty-three years; Japanese. Nineteen years ago he had an unidentified eruptive fever. Bowels have always been regular, excepting during four attacks of his present trouble, to be described later. Seven years ago, without any apparent cause, he had an acute attack of severe pain in the right lower quadrant of the abdomen. He was confined to bed with this attack for two months, during which time he had several attacks of vomiting, intermittent constipation, and some fever. He was treated by the application of an ice-bag, locally, and by internal medication. His convalescence was gradual.

He had no recurrence of these abdominal symptoms, with the exception of infrequent pains in the right iliac fossa, until two years ago, when he was suddenly seized with severe pain in this locality, accompanied by fever. He did not go to bed and recovered at the end of two weeks.

With the exception of infrequent attacks of slight pain, he remained free from all symptoms referable to his abdominal condition until thirteen days ago, when he was suddenly seized with a severe pain in the right iliac fossa, which compelled him to take to his bed. He did not vomit, but thinks he had some fever. The next day he was brought to Bellevue Hospital, where he was treated by the application of an ice-bag to the abdomen. His temperature, while in the hospital, remained low, his pulse ranged between 90 and 100, and he had a leukocytosis of about 12,000. At the end of five days he was discharged, cured.

Two days ago he had an attack of pain similar to his previous ones. He kept at work for twenty-four hours, when the pain became so severe that he was compelled to go to bed, and had two attacks of vomiting. He then returned to Bellevue Hospital, and soon after his admission had four attacks of vomiting.

Present Condition. His temperature ranged between 97.5° and 99.5°; his pulse between 100 and 116; respirations between 20 and 28. The blood count showed 4,000,000 red cells; 15,000 white cells. The differential count gave the following result: polymorphonuclear cells, 85 per cent.; large lymphocytes, 8 per cent; small lymphocytes, 7 per cent. The bowels were obstinately constipated after one small passage, resulting from an enema. Examination showed slight tenderness and resistance at McBurney's point, but no tumor could be made out. A diagnosis of recurrent catarrhal appendicitis was made and the patient was prepared for operation.

Operation. The cæcum was exposed through the usual intermuscular incision, and was drawn into the wound. The appendix

was inspected and found to be normal in every respect. It lay in the retrocæcal position. Further inspection disclosed the fact that the lumen of the cæcum was occupied by a mass as large as a duck's egg and of a similar shape. The mass was tense, fluctuating, and smooth, and that portion of the gut wall opposite the mesocolic attachment was freely movable over it. The mass was at first supposed to be an intussusception of the terminal portion of the ileum, but as no reduction could be effected by taxis or traction on the ileum, the cæcum was opened by an incision parallel to its circular fibres, and the tumor delivered and examined. It was covered by what appeared to be congested, eroded, and transformed mucosa. It was apparently sessile over about one-fifth of its surface, that portion being attached to the mesocolic border. (Here, and subsequently, I use the terms "mesocolic" and "mesocolon" for the sake of convenience, to indicate that portion of the ascending colon which lies in contact with the parieties, and is devoid of a peritoneal covering. This is the manner of fixation which is regarded as normal in 74 per cent. of cases.*)

The examining finger was then passed around the lower extremity, which lay free in the cavity of the cæcum, and on through the ileocæcal valve, which was found to be patulous. The upper half of the ileocæcal valve was apparently fused with the outer covering of the tumor. The upper end, corresponding to the smaller end of an egg, was more sessile than the lower, and terminated in a sort of funicular process, about two inches in length, lying in contact with the mesocolic wall of the gut, its diameter diminishing to nothing at its upper end. An incision was then made through the presenting wall of the tumor, in the line of its longest diameter, and between three and four ounces of a clear, viscid fluid was evacuated, which, unfortunately, was not saved.

The cavity of the cyst was then inspected and was found to be lined with a smooth, glistening membrane, of a grayish color. The cyst wall was three-sixteenths of an inch in thickness, firm and hard, but somewhat friable on its outer surface. The interior lining was smooth and very firm, and the cavity of the cyst corresponded in shape to its outer surface, with the exception that it did not extend into the funicular process, already described, at the upper end. While at the site of the attachment of the tumor to the gut wall there was discovered a funnel-shaped pocket extending for about two inches backward and inward between the layers of the mesentery of the ileum, and just large enough to easily admit the examining finger.

No attempt was made to enucleate the cyst on account of the firmness of its incorporation with the adjacent structures. The only procedure by which the cyst could have been removed would

* Huntington, Anatomy of Peritoneum and Abdomen, p. 82.

have been a complete resection of the cæcum, the terminal portion of the ileum, and part of the ascending colon, and this was not considered advisable. Consequently, the free portion of the cyst wall was trimmed off to within a quarter of an inch of its point of fusion with the gut, and the somewhat sharp venous hemorrhage from the cut surfaces was readily controlled by a rapidly applied continuous catgut suture. The wound in the gut was then closed by three layers of sutures, applied in the usual manner. A small cigarette drain was left in as an extra precaution, and the abdominal wound was closed in the usual way. The drain was removed on the third day, and the patient made an uninterrupted recovery.

To my great chagrin the excised portion of the cyst wall was lost, and in the absence of any pathological report I am reduced to the necessity of speculation to determine the character of this most rare condition. A few cases have been described which resemble this one to a limited extent, but upon close study their points of similarity with this one are so few as to render them of little value in determining the origin of the cyst, and therefore my conclusions are based rather on analogy than on the reports of the cases themselves.

In order to arrive at a definite conclusion as to the origin of the cyst reported above I shall review briefly the question of cysts of the intestine, mesentery, and general abdominal cavity in the light of recent pathological investigations. The subject resolves itself, practically, into two classes: cysts of the gut itself, and cysts of the mesentery. The question of cysts of the gut is not a large one; that of mesenteric cysts is more complex and will require a few words of preliminary explanation.

In 1892 Bracquehaye[7] classified mesenteric cysts as follows: 1. Sanguineous cysts, or hæmatomata, including certain serous cysts. 2. Lymphatic cysts, including chylous cysts and most of the serous cysts. 3. Parasitic cysts; hydatids. 4. Congenital cysts, or dermoids. 5. Cysts of adjoining organs (ovaries, parovarian, head of pancreas, etc.).

In 1897 Moynihan[49] classified them as: 1. Serous cysts. 2. Chyle cysts. 3. Hydatid cysts. 4. Blood cysts. 5. Dermoid cysts. 6. Cystic malignant disease.

In 1900 Dowd,[19] finding these two classifications unsatisfactory, made a further classification based upon the origin of the cysts, which, while simpler than those quoted above, seemed also to be more reasonable.

Dowd's classification is as follows: 1. Embryonic cysts. 2. Hydatid cysts. 3. Cystic malignant disease.

It will be seen that Dowd has eliminated such terms as "sanguineous," "lymphatic," "serous," and "chylous" in his classification of these cysts, for reasons which he has set forth in his admirable paper. As his arrangement seems to me to be far more rational

and scientific than the earlier ones, it may not be amiss to give here briefly his reasons for the eliminations he had made. The Bracquehaye and Moynihan classifications are essentially similar, and a criticism of the headings of the former which he has eliminated will indicate sufficiently the weak points of both.

1. *Sanguineous Cysts.* This term is misleading, since blood-containing cysts of the mesentery may be either simple hæmatomata or any variety of cyst into which hemorrhage has taken place secondarily. Cysts have been described under this heading in which the contents varied from "slightly blood-stained" (Morton[49]) to "thin brownish-red" (Hahn[28]), though the evidence is in favor of the belief that they were not primarily blood cysts at all, but were cysts of some other nature into which hemorrhage had subsequently taken place. I agree with Dowd that these cysts should be classified according to the structure of their walls and the chemical character of the fluid, rather than to put them under the head of blood cysts merely on account of the apparent character of their contents.

2. *Lymphatic Cysts (Chylous or Serous).* Although for many years authors have employed these designations in their description of certain mesenteric cysts, the propriety of such a terminology seems to me to be open to considerable doubt, and, as expressing my own conviction on this point, I cannot do better than to quote from Dowd's article on mesenteric cysts:*

"It has been generally supposed that these [chylous] cysts are due to a dilatation of some one of the lacteal or the chyliferous vessels, as taught by Rokitansky half a century ago. It has also been suggested that there has been an effusion of chyle into previously existing cysts; this seems much more probable. We can see how a duct which has a gland behind it might become cystic if it were occluded; the size of the cyst depending upon the extent to which the pressure of the cyst fluid could distend its wall. It is not easy to understand how this process could take place in vessels so rich in anastomosis as are the chyle vessels. There are records of at least ten cases where the thoracic duct, or one of its main branches, has been wounded, and either sutured, ligated, or packed, without evidence of cyst formation. Ziegler[74] states that occlusion of the thoracic duct may be followed by anastomosis, or by distention of the lymph vessels, and mentions the distention of the lacteals into elongated, tortuous forms in certain instances where they have been obstructed.

"One cannot deny the possibility of cyst formation by this process, but it is unlikely, and at variance with ordinary pathological processes. It seems far more likely that chyle should be effused into the cavity of cysts already formed, particularly as lymph nodes have been found in the walls of mesenteric cysts, thus indicating the

* Annals of Surgery, October, 1900.

presence of lymphatic structures; and spaces are seen in the cyst walls which are apparently lymph channels.

"Taking these cases together, it seems pretty well established that chylous cysts are really preformed cysts, situated in such close relation to the lacteals that chyle has been effused into them, and that they are really of embryonic origin, in structure similar to ovarian and parovarian cysts."

The etiology of cysts within the abdominal cavity is at best a complex subject, and in order to make the question more readily comprehensible, I have adopted the following classification, which is based on Dowd's arrangement, but enlarged to include cysts of the intestine itself. There are also some minor amplifications which have been suggested by reports of recent cases:

1. Cysts arising from the glandular structures of the intestinal wall.
2. Parasitic cysts (hydatids).
3. Embryonic cysts.
4. Cysts of the normally placed retroperitoneal organs.
5. Cystic malignant disease.

I will consider them as briefly as possible in the above order:

1. *Cysts Arising from the Glandular Structures of the Intestinal Wall.* These cysts originate in an occlusion of the mouths of the intestinal glands (crypts of Lieberkühn, etc.), following some inflammatory process, generally a chronic enteritis or colitis.

The inflammation and subsequent thickening of the mucous membrane closes the mouths of these follicles, the cavities of which then become cysts by the retention of their secretions (Fränkel[23]). These cysts are generally multiple and vary in size from 1 to 4 cm. in diameter. They may occur in any part of the colon or small intestine, but are generally found in the former.

Rokitansky[58] says: "Cysts of the intestinal wall are rarely seen. The cases mentioned in this relation are principally multilocular, partly lying in the gut wall and partly in the subserous tissue, and containing serous fluid."

Fränkel[23] reports the case of a four-year-old child upon whom a resection of the head of the femur had been done for osteitis. Convalescence was interrupted by an attack of dysentery, followed by death. The postmortem showed a thickening of the mucous membrane of the intestine, and many small cysts the size of cherries lying between the mucosa and serosa. Chemically the fluid contents consisted of mucin. The cysts lay principally in the mucous membrane, projecting downward to the muscular wall and upward to the muscularis mucosæ. The neighboring follicles of Lieberkühn showed the process of cyst formation from compression of their outlets. This was caused by a small-celled infiltration of the epithelium, accompanied by a loss of the normal epithelium.

Another case reported by the same observer probably also belongs

under this heading. The patient was an infant that died on the third day after birth with symptoms of intestinal obstruction. At the autopsy a cystic tumor was found at the end of the ileum. It was round, 2½ cm. in diameter, and projected into the lumen of the ileum and cæcum. It was not perceptible from the outside. The ileocæcal valve was stretched over the cyst, which contained clear mucus. A microscopic examination was not made, but macroscopically the inner wall appeared to be formed from the muscularis mucosæ.

Krogius,[39] in a review of the postmortem findings in sixteen cases of enteric cysts, says in part: "In four instances the cysts had their origin on this valve (the ileocæcal). Most of the cysts were in the intestinal wall itself, presenting on the convex side of the gut, and apparently sprung from either the submucous or subserous structures, or from between the two muscular layers. *Only in a few instances have they been found on the concave surface, between the layers of the mesentery.* A communication between the cavity of the cyst and the lumen of the gut existed in only two cases; in all the remaining cases the cyst cavities were entirely shut off from the canal."

An understanding of the morphology of the submucosa will indicate the possibility of retention cyst formation in that structure, although it is doubtful if cysts originating here could be differentiated macroscopically from cysts of the mucosa unless they were of very small size.

Huntington[35] says: "Situated between the mucous and muscular coats of the intestine this layer is known as the *submucosa*. It contains, embedded in its tissue, the glandular elements of the intestine, derived from the entodermal epithelium, and the bloodvessels, lymphatics, and nerves."

2. *Parasitic Cysts* (*Hydatids*). These may occur in the mesentery, as well as in other parts of the body, and should be considered as primary in the structure in which they are found. I have no record of one having been reported in the intestine itself, but Nannotti[50] has collected twenty-nine cases of hydatids of the mesentery. Psaltoff[55] and others have made similar observations.

This form of cyst is due to the growth of the *tænia echinococcus*, and the diagnosis is generally made by the peculiar, laminated character of the cyst wall and by the finding of scolices or hooklets, or both, in the cyst cavity. Sterile cysts are often found in which the scolices are absent. The normal echinococcus fluid is clear or slightly opalescent, though sometimes rendered turbid from admixture with disintegrated scolices, or fragments of the parenchymatous layer. It is either neutral in reaction, or slightly acid, or slightly alkaline, with a specific gravity between 1000 and 1015. It contains no albumin, but does contain sodium chloride, succinic acid, ptomains, and toxins.

3. *Embryonic Cysts.* (*a*) From remains of fetal organs; Wolffian and Müllerian bodies, omphalomesenteric duct. (*b*) From snared-off portions of the intestine; also Remak's diverticulum, and atypical intestinal diverticula. (*c*) From sequestrations of portions of the various retroperitoneal organs. (*d*) Dermoids.

Under this heading belong the major part of the cysts found in the abdominal cavity. Warthin[70] says: "Cysts arising from misplaced or persistent entodermal or mesodermal anlage are of relatively frequent occurrence. They are found most frequently in the broad ligaments and tubes, less often in the peritoneal cavity, intestine, in the neighborhood of the trachea and bronchi, in the lungs, pleura, tongue, neck, liver, kidneys, etc.

"They owe their origin to the persistence of fetal glands or ducts, or to misplaced entodermal or mesodermal epithelial anlage. Those found in the uterine wall, broad ligaments, and tubes arise from remains of the Wolffian body or the duct of Gärtner. In the peritoneal cavity and abdominal wall they may arise from snared-off and persistent portions of the intestine (enterocysts), or from portions of the urachus (urachus cysts). In the liver and kidney they may arise from portions of the gland tubules, which become constricted during the period of development (adenocysts).

"In the abdominal wall cysts lined with columnar cells may arise from remains of the omphalomesenteric duct (omphalomesenteric cysts)."

In this connection it may not be inappropriate to mention those extremely rare congenital cyst tumors of the abdomen which contain a more or less well-developed fetus, alive or dead.

Himly,[32] in an autopsy upon a female child, aged two and a half years, found a cystic tumor in the epigastrium, which contained a fairly well-developed fetus, with, however, defective extremities and head.

Klebs[37] reported the case of an infant in whom independent motions were observed within an abdominal tumor. The child died a few weeks after birth, and at the autopsy a cyst was found behind the transverse colon, composed of peritoneum and amnion, and containing an umbilical cord to which was attached a partially developed fetus.

Highmore[31] reported the case of a boy, aged seven years, in whose abdomen a cystic tumor began to develop. Its increasing size caused repeated attacks of partial intestinal obstruction, and at the age of fifteen years he died in consequence of an intestinal hemorrhage. During life pulsations could be felt in the cyst, and the patient declared that his abdomen contained something living. The autopsy disclosed a tumor weighing over four pounds, attached along the entire length of the duodenum, which communicated with it and formed part of the sac. The latter contained an imperfect fetus, the nutrition of which was maintained by a short cord which estab-

lished the connection with the vascular walls of the sac. (Piersol, *Reference Hand-book of the Medical Sciences*, "Teratology.")

(*a*) *From Remains of Fetal Organs.* The part played by these remains in the production of abdominal cysts is very clearly set forth in the following case reported by Lockwood.[42] The patient was a female, aged twenty years, in whom an operation disclosed a cyst as large as an ostrich's egg, behind the descending mesocolon. The colon lay to its outer side, but had no connection with it. After removal of the cyst the ureter, which lay behind it, came into view. The cyst itself lay among loose connective tissue behind the peritoneum. It was unilocular, and filled with a chocolate-colored, semifluid mass, consisting of fibrin, blood pigment, and cholesterin. Histological examination showed the contents to be simply an altered blood clot. It did not show either scolices, hooklets, or daughter cysts. There was no glandular structure found. In attempting to account for the origin of the cyst, he says, in part:

"The suprarenal body may be developed from the Wolffian body, but at all events it is continuous with it until a late period of intrauterine life. At this period the lower end of the Wolffian body is already becoming converted into the epididymis and other structures about the testis; in the female it is becoming epi- or parovarian. Thus it is evident that between the suprarenal body and the ovary or testis there is, along the course of the ureter, a part of the Wolffian body which has hitherto been unaccounted for. How long this persists or what may be its ultimate fate is unknown. . . . Now, it is so notorious that the part of the Wolffian body which is in relation to the ovary or testis is prone to give rise to various kinds of cysts, that it does not seem unreasonable to assume that the remaining part—viz., that which lies along the course of the ureter—may do so likewise; and I venture to suggest that this is the origin of the cyst which I have just described."

According to Moynihan,[40] the congenital remnants of the Müllerian and Wolffian ducts and bodies are regularly found between the layers of the mesentery; and it is now very generally believed by pathologists that these "rests," which seem particularly prone to undergo cystic degeneration, are responsible in a great measure for certain mesenteric cysts, as well as for cysts of the ovary, parovarian, and Gärtner's duct.

The origin of the congenital cystic kidney is by some pathologists ascribed to an inclusion of a portion of the Wolffian body or Müller's duct within the kidney itself. (Von Bergmann,[68] Sutton.[65])

Dowd, referring to this method of causation, says: "It is altogether within the bounds of probability that such a separation should from time to time take place from the Wolffian body or the germinal epithelium at an early time in embryonic life; and, if such portions are separated, it is not strange that they should be carried into the mesentery, mesocolon, or mesorectum in the course of their develop-

ment, and there form cysts . . . ; or, if they should not be carried into the mesentery, they might develop as retroperitoneal cysts, some of which are certainly similar in structure to the mesenteric cysts; or, if they should be carried into that portion which forms the great omentum, they would form omental cysts, which are also of a similar structure."

The omphalomesenteric duct is another fetal organ which may give rise to intra-abdominal cysts. Riesman,[57] speaking of Meckel's diverticulum, says: "It is usually on the convex border of the gut, but it sometimes arises nearer the mesentery. Very rarely it lies entirely within the mesentery." Its usual position, with regard to the ileocæcal valve, is about one metre or more above that structure, but Fitz[22] reports a case of his own in which the obliterated remains of the omphalomesenteric duct were found at a distance of 3 cm. from the valve; and Wernher[72] cites another instance in which it was found at a distance of an inch and a half from the cæcum.

Piersol[53] says in this connection: "The diverticulum may become constricted and its communication with the gut entirely lost, it remaining attached to the gut as a cyst-like appendage. The latter may mark the seat of an active growth, resulting in the production of an intestinal cyst of huge size."

The following curious case, reported by Poirier,[54] was probably of this origin: The patient was a woman aged twenty-eight years, who had had repeated attacks simulating appendicitis. An operation disclosed a cystic tumor the size of an orange, attached to the convex side of the terminal portion of the ileum by an imperforate pedicle, the torsion of which was responsible for the attacks.

Krogius[39] quotes Quesnel as follows: "In sixteen cases of simple intestinal cysts ten were in children less than six months old, four in children from one to five years old, and in only two cases were the patients older (one twenty years old and one sixty years). They occur with about the same frequency in males and females. As a rule, the cysts have been small, from the size of a cherry to 4 cm. in diameter. *The cysts were generally found at the site of the usual location of Meckel's diverticulum* in the lower part of the ileum, the greatest distance above the *valvula Bauhini* (ileocæcal valve), being one metre."

I have been unable to find records of any cases which were ascribed positively to an occlusion of the lumen of Remak's diverticulum, but I think it possible that some of the cases reported above may have been of this origin.

This diverticulum originates from the epiblastic layer of the neural canal in very early fetal life. Owing to a faulty closure in this canal a process of the epiblastic layer may be pushed forward through the chorda dorsalis and between the layers of the primitive mesentery. With the subsequent closure of the canal the extruded portion is snared off and remains as a potential cavity lined with

epithelium, which may eventuate in a retroperitoneal or mesenteric cyst.

(*b*) *From Snared-off Portions of the Intestines.* The possibility of this etiology has already been briefly alluded to above. Dowd[19] has collected the reports of four of these remarkable cases, which I quote below:

"The most remarkable one was recorded by Studgaard.[64] It was in the mesentery, contained 200 c.c. of chocolate-colored fluid, and had a funnel-like process or pedicle thick as one's thumb, which had to be severed in removing the cyst, the cut extending through the different layers of the cyst wall. The inner surface of the sac was in parts smooth and shiny; another part had the appearance of mucous membrane, and section through this showed a layer of tubular glands tightly packed together, with a membrana propria, a single layer of cylindrical epithelial cells, and a perceptible lumen; beneath this layer there was a muscularis mucosa, then a submucous layer of connective tissue, then a layer 2 mm. in thickness, composed of smooth muscle fibres running parallel with the circumference of the aperture in the cyst wall; and outside of this another layer, half as thick, composed of smooth muscle fibres running at right angles with those of the first layer; then connective tissue and serosa.

"The cyst wall was therefore in perfect agreement as to structure with the wall of the intestine, save that in the latter we do not find an irregular hypertrophy of the tubular glands, with degeneration of the superficial layer which was shown here, nor were Peyer's patches or solitary glands shown. On the smooth portion of the cyst wall this layer of villous mucous membrane was represented by a connective-tissue layer containing pigment and epithelial cells, irregular in formation and arrangement. The situation in the mesentery is not given."

"Eve[20] has described a cyst removed from the mesentery of the jejunum, which had in its wall three layers of unstriped muscle fibres. The section showed the middle layer cut transversely and the other two longitudinally. He refers to specimens in the Museum of the Royal College of Surgeons, No. 2352 E, from a girl of nine, which had a considerable quantity of unstriped muscle fibre in its walls.

"Fehleisen[21] has also described a multilocular cyst which contained 8200 c.c. of clear, reddish-brown fluid, and had unstriped muscle fibres in the cyst walls. The walls contained three layers: 1. An outer, dense connective tissue. 2. Median, very vascular connective tissue, loosely arranged. 3. Internal layer, exclusively unstriped muscle fibres, arranged longitudinally, but with large bundles having a more or less irregular construction. 'The muscle fibres were characteristic; they differed in no respect from those found in the intestinal tract or bladder.'

"Brentano[8] also describes a mesenteric cyst in the wall of which there were smooth muscle fibres under the serosa. The fluid contained fibrin and degenerated blood cells."

Although I have placed these cysts under the heading of "Snared-off Portions of the Intestine," to conform to the classification given them by the pathologists, I am inclined to attribute them rather to snared-off portions of some of the various atypical diverticulæ, of which I will now speak.

Multiple diverticulæ of the large and small intestine have been frequently reported, and although I can find no record of their having given rise to cysts, it is not difficult to believe that they might do so under favorable conditions.

Wallman[69] says: "Diverticulæ of the intestine are not uncommon. In the Josephs Academy Museum of Pathological Anatomy is a piece of small intestine, 48 cm. long, containing thirty-seven diverticulæ ranging in size from a bean to a pigeon's egg. *Thirty of these lay between the layers of the mesentery.*"

He also described a true diverticulum, 10 cm. long, located on the free surface of the large intestine, two feet above the ileocæcal valve. Another specimen in the same collection, a piece of small intestine, has on its free surface two diverticulæ, one 8 cm. and the other 11 cm. long.

In an autopsy on the body of a man, aged sixty-six years, he found nine true diverticulæ of the large intestine distributed as follows: one on the ascending colon, three on the transverse, three on the descending, and two on the sigmoid flexure. Of these, seven were on the free surface, the other two being between the layers of the mesocolon. Grawitz,[20] in an elaborate article, refers to this condition and reports several cases.

(*c*) *Cysts Arising from Sequestrations of Retroperitoneal Organs.* The literature of teratology is replete with instances of this curious sequestration of portions of the various organs in all parts of the body, and it is well recognized that such fragments are prone to undergo cystic degeneration in their abnormal locations.

Piersol[53] makes the statement that accessory or dislocated lobes of the liver have been found within the falciform ligament; that isolated masses of pancreatic tissue have been found embedded within the intestinal and gastric walls. These masses may remain in *statu quo*, or may later in life become the seat of cysts of large size. Fitz[22] refers to two cases where an accessory pancreas was found in the end of Meckel's diverticulum.

Accessory spleens have frequently been described. Albrecht[1] describes a case in which the principal organ was absent, and instead segments or supernumerary bodies of splenic tissue to the number of almost 400 were found scattered throughout the abdomen.

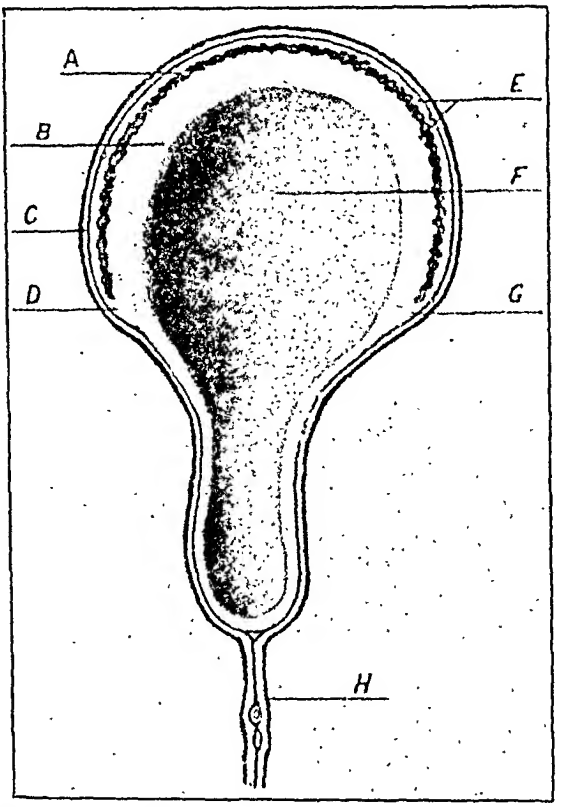
Accessory suprarenals have been found at considerable distances from the main organ; for instance, between the testicle and epididy-

mis and between the layers of the broad ligament (Piersol[53]). Lockwood[42] removed several small tumors from the spermatic cord, which, upon microscopic examination, proved to be adrenal tissue.

Cases of congenital fragmentation of the *glandular* elements of the prostate have also been observed.

(*d*) *Dermoids.* I can find no record of retroperitoneal dermoids in the male, though numbers of cases have been reported in the female. It is very generally believed that these tumors have their origin either in a sequestration of ovarian tissue or in a developmental

FIG. 1



A, cavity of cæcum; *B*, cyst wall; *C*, gut wall; *D*, line of free portion of cyst; *E*, mucous membrane of gut; *F*, cyst cavity; G, line of free portion of cyst; *H*, leaves of peritoneum at ileo-cecal angle.

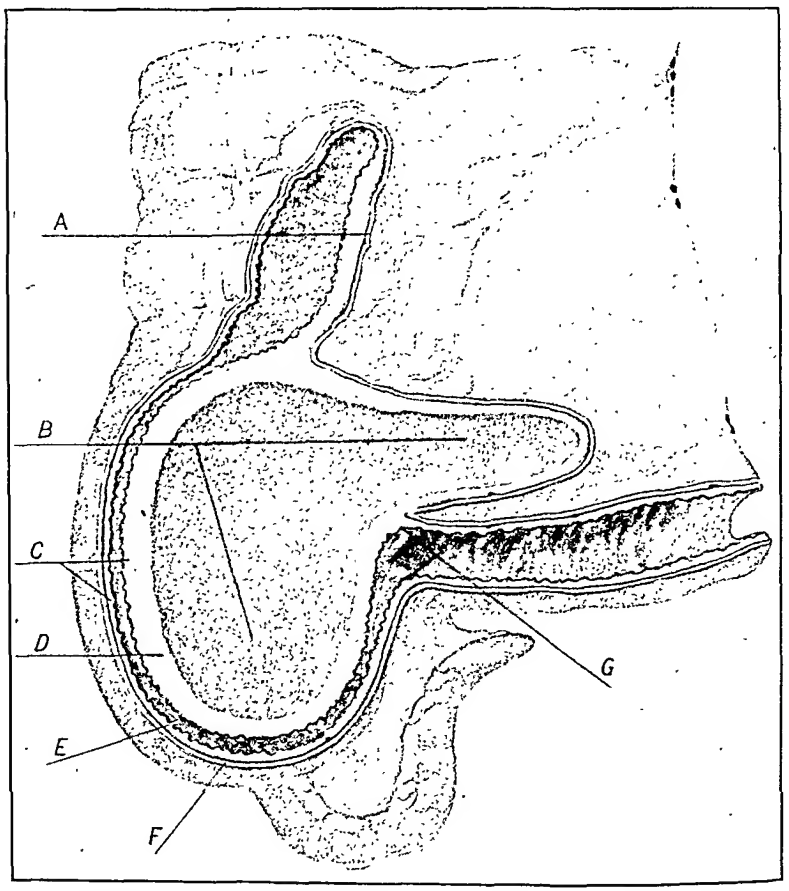
defect of an ovum. Douglas,[18] however, believes that they may originate in structures which persist from fetal life, as the Wolffian body and Müllerian duct. Dermoids of the testicle have been reported, and as the testicle is originally a retroperitoneal organ, it is conceivable that cryptorchism, complicated by dermoids, might occur. These dermoids are thought by some pathologists to be due to a double fecundation.

Cohnheim attributed the origin of retroperitoneal dermoids to the inclusion of aberrant portions of the ectoderm within the ovary in early fetal life, and for a long time it was believed that all mesen-

teric dermoids had an ovarian origin, and only secondarily became mesenteric (Bauman[4]).

Hall[29] has recently reported a case of a large dermoid cyst of the mesentery of the ileum in a girl aged eight years. Its position was twenty-five inches above the ileocæcal valve. Other cases have been reported by Schutzer,[62] Mayer,[45] Spencer Wells,[71] Langton,[40] and König.[38]

FIG. 2



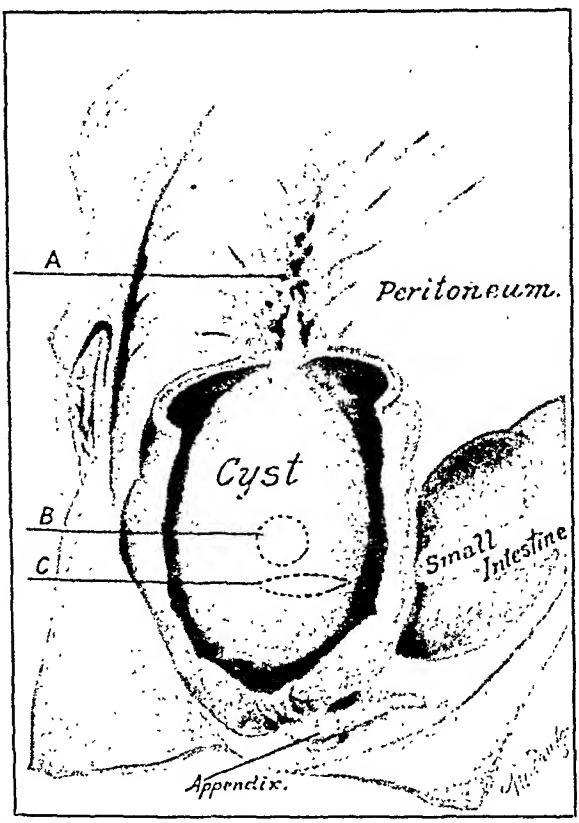
A, funicular process; *B*, cyst cavity; *C*, mucous membrane; *D*, cyst wall; *E*, cavity of cæcum; *F*, cut edge of gut wall; *G*, ileo-cæcal valve.

4. *Cysts of the Normally Placed Retroperitoneal Organs.* Instances of these cysts are too numerous to require more than a word in passing. The organ most likely to give rise to a mesenteric cyst is the pancreas. Hodenpyl[34] tells me that he recently discovered such a cyst postmortem which had pushed its way for some little distance between the layers of the transverse mesocolon.

5. *Cystic malignant disease* of the mesentery or intestine is of rare occurrence. Dowd cites a case reported by Keen[30] of a cystic sarcoma of the omentum in which the fluid weighed 10 pounds. Graff[25] removed part of a dermoid cyst as large as a child's head, which presented in the ischiorectal fossa, but which had its origin between rectum and sacrum and had begun to undergo carcinomatous changes.

Diagnosis of the Nature and Method of Production of the Cyst in Question. In the absence of any histological details I am obliged

FIG. 3



A, mesocolic border; *B*, site of funnel-shaped process; *C*, site of ileo-cæcal valve.

to arrive at my conclusions by a process of elimination, based largely upon the gross characteristics of the cyst.

In the first place, from the presence of the curious diverticulum of the cyst which lay between the layers of the mesentery of the ileum (or behind the reflexion of parietal peritoneum on the inner side of the colon), I conclude that the cyst was either of mesenteric or retroperitoneal origin. This and the thickness and density of its walls would at once exclude cysts originating from the mucosa or submucosa of the gut. A hydatid origin may next be excluded with a fair degree of certainty by the viscid clearness and homogeneity

of its fluid contents. The same reasons would also exclude a dermoid. Cystic malignant disease is excluded, for obvious reasons.

This leaves to be considered embryonic cysts and cysts of normally placed retroperitoneal organs, of which the latter can be safely thrown out, as there is no organ in the immediate vicinity which could give rise to such a cyst.

Of the embryonic cysts due to "rests" of fetal organs, those arising from the ductus omphalomesentericus can be excluded on account of the relation of this cyst to the ileocæcal valve and the position it occupied in the lumen of the colon and in the mesentery.

An origin from a snared-off portion of the intestine can, I think, be excluded, as the walls of this cyst had nothing suggestive of this condition. The same reasoning also applies to cysts arising from Remak's diverticulum or from the atypical diverticulæ heretofore described.

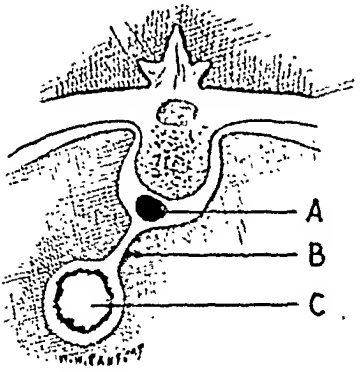
Between the two remaining varieties of embryonic cysts, those due to fetal "rests" and those due to sequestrations, I am unable to decide with so much certainty, but I am inclined to throw out the latter on the ground of probability, in the absence of a better reason, because I believe that the "rests" above referred to are a more frequent source of cysts than are the sequestrations.

For the sake of argument, then, let us suppose that the cyst in question had its origin in the Wolffian body, the Wolffian duct, or Müller's duct. A more accurate designation as to which of these structures was concerned in its production is impossible, as well as immaterial. Recognizing the tendency of these "rests" to undergo cystic degeneration and postulating the existence of such a process in the present instance, it is not difficult to conceive the chain of events beginning with a tiny retroperitoneal "rest" *in fetu* and ending with the same structure, which has undergone cystic degeneration, has become many times enlarged and has migrated between the layers of the mesentery during the development of that structure as far as its attachment to the gut, there pushing before it the structures forming the wall of the intestine, and eventually lying, to all intents and purposes, within its lumen, though anatomically speaking, outside it. Such a cyst, a portion of it lying between the comparatively unyielding layers of mesentery, and another portion lying free within the lumen of the intestine, would be likely to assume the pyriform outline which I have described as being one of the peculiarities of the cyst in question. The position of the cyst at the angle formed by the mesentery of the ileum and the reflexion of the peritoneum at the ascending colon renders it difficult to say under which of these structures the funnel-shaped portion lay; but this is a matter of no consequence, since the mesentery and this peritoneal reflexion are, in early fetal life, one and the same anatomical structure, and it is only after the rotation of the intestines and the subsequent adhesion between the right leaf of the

mesentery with the parietal peritoneum that the differentiation between mesentery and ascending mesocolon becomes an anatomical fact.

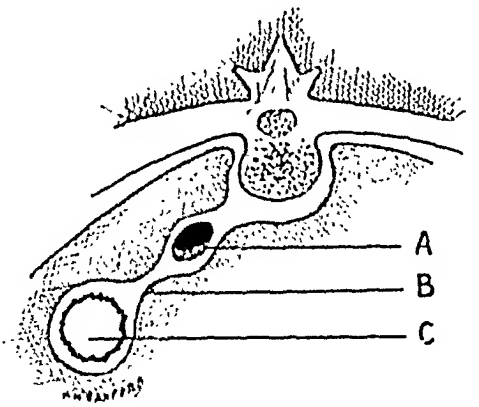
(I use here the term "mesocolon" merely as a matter of convenience, and in the same sense with which I have qualified it earlier

FIG. 4



A, cyst; *B*, asc. mesocolon; *C*, lumen of gut.

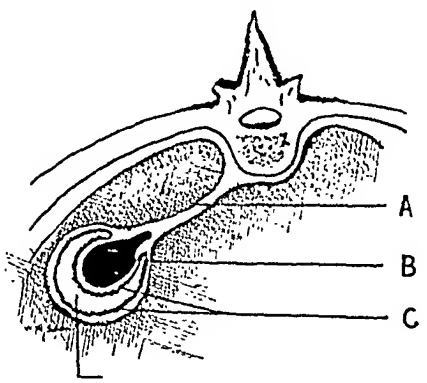
FIG. 5



A, cyst; *B*, asc. mesocolon; *C*, lumen of gut.

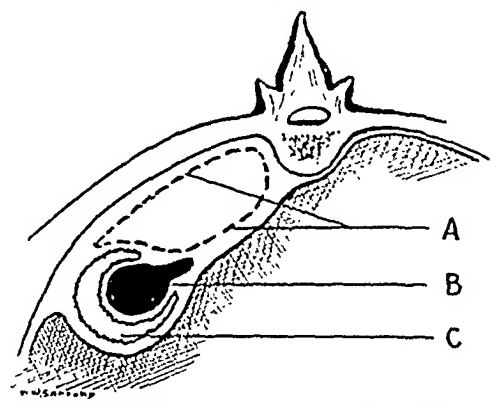
in this paper, in order to indicate that portion of the ascending colon which is normally adherent to the parieties in the adult, and to convey to the mind the relation which this portion bears to the ascending mesocolon in the fetus.)

FIG. 6



A, asc. mesocolon; *B*, cyst; *C*, asc. colon invaginated by cyst; *D*, lumen of gut.

FIG. 7



A, area of adhesions between right layer of sac, mesocolon, and primary parietal peritoneum; *B*, cyst; *C*, lumen of gut.

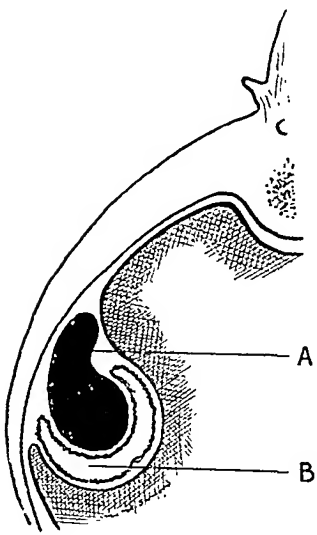
Figs. 4, 5, 6, 7 and 8 are intended to represent in a schematic way the probable course and final resting-place of the cyst which I have described, and will, I think, require no further elucidation.

As I have stated at the beginning of this paper, I have been unable, after a fairly careful search through the literature of enteric and mesenteric cysts, dating back many years, to find any record of a cyst similar to the one here reported. I have, however, found

reports of several enteric cysts of comparatively large size, though evidently not of the same origin as this one, and, as a matter of interest in this connection, I give below a condensed description of the more appropriate cases.

In 1887 Sainsbury[60] removed from the cæcum of a young girl a cystic tumor the size of a duck's egg, ovoid and smooth. Anatomical and histological details are wanting. The contents were a very dark, ropy, mucoid fluid. He believed that it was possibly due to a cystic dilatation of one of the lips of the ileocæcal valve.

FIG. 8



A, cyst; *B*, lumen of cæcum invaginated by cyst.

In 1903 Condamin[14] operated upon a woman for intestinal obstruction. Upon opening the cæcum, within which a mass was felt, he found a cyst filling up the entire cavity of the gut, and attached by a pedicle to the wall near the origin of the appendix. He states that the patient had previously been operated upon for a right ovarian cyst. The histological appearance of the specimen removed resembled the structure of a typical ovarian cyst.

In 1856 Conant[13] reported having found at autopsy in a male subject a cystic tumor containing a thick, creamy, semifluid substance and "attached to the ileum at its junction with the cæcum. It appeared to have existed between two folds of peritoneum." This is the only case I have been able to find which in any way resembled my own, but the details are so vague as to render it of little value.

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REPORT ON THE ACTION OF VARIOUS SUBSTANCES ON PURE CULTURES OF THE AMŒBA DYSENTERIÆ.

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of Philippine Islands.

In considering the subject of the local treatment of amœbic dysentery, one encounters a long list of drugs recommended by individual experimenters and clinicians, but the one recommended by the large majority of the medical profession is quinine in some form or other. It is employed in solutions varying in strength from 1: 5000 to 1: 3000, ½ to 1 litre, two or three times a day, as recommended by Councilman and Lafleur in their classical monograph, published in 1891, all the way up to the excessive concentration of 1: 100, recommended by J. H. Ford, in a recent number of the *Journal of Tropical Medicine*. Osler recommends a warm solution of quinine, 1: 5000, 1: 2500, or 1: 1000, and states that they have used them with great benefit in the wards of the Johns Hopkins Hospital.

Councilman and Lafleur summarize their experience with quinine enemas as follows:

"Quinine injections do destroy amœbæ in the bowel, but it is questionable if they reach the amœbæ in the tissues. Such treatment is serviceable in early cases and those where the rectum, sigmoid flexure, and descending colon are the limit of the disease."

Among the drugs less commonly recommended for the local treatment of amœbic dysentery we find the following: bichloride of mercury, 1: 5000 to 1: 3000; nitrate of silver, 1: 500; dilute nitric acid, recommended by H. A. Lafleur in Allbutt's *System of Medicine*.

Cold water enemas, recommended by Tuttle. Potassium permanganate, 1: 1000 to 1: 2000; eucalyptol, 1: 1000; sodium bicarbonate, 4: 100, recommended by J. H. Ford. Tannin, 1: 200; ichthyol, 1: 250, in combination with salts of bismuth, recommended by Hemmeter.

It will probably be admitted, however, by those who treat large numbers of amœbic dysentery patients that the ideal substance for local treatment has not yet been discovered. Weak solutions of quinine fail to destroy the amœbæ which frequently persist in spite of two or three large injections daily; strong solutions are often too irritating to be practical, or, in the case of susceptible subjects, may reduce the patient to a state of chronic cinchonism by the absorption of the drug from the bowel. This last condition is more apt to occur where the practice prevails of giving several strong injections a day.

The stronger antiseptics are likely to be irritating or dangerous on account of their toxic properties.

The perfection by Musgrave and Clegg of the technique of growing the amœbæ in pure strains in symbiosis with a single variety of bacteria has made it possible to observe with a considerable degree of accuracy the action of chemical substances on the amœbæ, and it is with the results of a series of such experiments conducted by myself in the Bureau of Government Laboratories during December, 1904, and January, 1905, that this report is concerned.

The standard amœba used in these tests is described as follows by Musgrave and Clegg in *Bulletin No. 18, of the Bureau of Government Laboratories*, published in October, 1904: "Amœba No. 11,524 was isolated from a dysenteric stool. The patient, an American nurse, had been suffering with intestinal amœbiasis (amœbic dysentery) for about one year, and amœbæ had repeatedly been found in her stools during that time. . . . The course of the disease was a usual one, with very chronic tendencies and with frequent and sometimes quite severe exacerbations.

"Our first cultures were made during such an exacerbation and at a time when there could be no reasonable doubt as to the correctness of the diagnosis. . . .

"Growth was found to be very satisfactory for a long time on a medium composed of 2 per cent. agar and 0.5 per cent. beef extract (1 per cent. alkaline), the development decreasing only when a marked diminution in the number of bacteria, which is usual with this medium, occurred.

"Microscopically this protozoön as obtained from culture is indistinguishable from those seen in the stools of the patient, and it is a true dysenteric amœba. Its measurements in the round stage in the stool were 25 to 35 microns, and those in the cultures generally correspond with these figures, but they varied greatly, owing

no doubt to environment and the phase of the life cycle at the time of the examination.

" . . . In our collection there now are cultures of this amœba which were started from a single parasite. They are in pure culture with four different bacteria—B. coli, S. choleræ, and two different pigment-producing saprophytes. The protozoa grow well with all these organisms, and by methods already given, have been changed from one to the other, and *vice versa*.

"In one instance dysentery in man followed the ingestion of three gelatin capsules filled with scrapings from the surface of cultures of this amœba in symbiosis with a harmless bacterium. Dysentery has also been produced in monkeys by similar cultures, as well as with others where the bacterium in symbiosis was a pathogenic one."

This amœba in symbiosis with the cholera spirillum was used in the experiments to be described. The culture medium employed was the special agar medium recommended by Musgrave and Clegg and described in the above quotation. The amœbæ in the encysted state are much more resistant to the action of drugs by virtue of their impervious shells. In order to eliminate these encysted forms from the experiments as far as possible, I made many observations on cultures of the amœbæ at varying periods of their growth, and determined that, when cultivated on the special agar medium at room temperature in Manila, the amœbæ had reached their maximum activity in about forty-eight-hours, by which time practically all were free and motile. In a few hours more many had begun to encyst, and by the end of seventy-two hours a large proportion of them had completely encysted. Consequently, after the first few preliminary experiments the forty-eight-hour cultures were used as a matter of routine.

The first series of experiments was made by pouring the solutions to be tested over the surface of forty-eight-hour slant cultures of Amœba No. 11,524, and at the end of ten, twenty, thirty, or sixty minutes pouring off the solution, washing the surface lightly with sterile water to remove all traces of the antiseptic and then making transplants from the surface to fresh media. Control transplants were made from every tube containing the amœba cultures before adding the solution to be tested.

The following results were obtained by the above-described method:

TABLE A.

Antiseptic.	Dilution.	Antiseptic applied.	Growth of amœbæ after exposure to antiseptic.	Visible growth of symbiotic bacterium.
Acid succinic peroxide	1 : 1000	10 min.	Few	No.
" " "	1 : 1000	30 "	"	"
" " "	1 : 1000	60 "	Very few	"
" " "	1 : 500	30 "	" "	"
" " "	1 : 500	60 "	" "	"
" tannic	1 : 100	10 "	Very many	Yes.
" "	1 : 100	20 "	" "	"
" "	1 : 100	30 "	" "	"
Copper sulphate	1 : 1000	10 "	" "	"
" "	1 : 1000	20 "	" "	"
" "	1 : 1000	30 "	Many	"
" "	1 : 2000	20 "	Very many	"
" "	1 : 2000	30 "	" "	"
Ichthyol	1 : 250	10 "	" "	"
"	1 : 250	20 "	Many	"
"	1 : 250	30 "	"	"
Oil cassia	1 : 5000	10 "	Very many	"
" "	1 : 5000	20 "	Many	"
" "	1 : 5000	30 "	"	"
" "	1 : 10,000	30 "	"	"
Potass. permanganate	1 : 2000	30 "	"	?
Quassia infusion	U. S. P.	30 "	Very many	?
Quinine sulphate	1 : 500	20 "	" "	Yes.
" "	1 : 500	30 "	Many	"
" "	1 : 250	10 "	Very many	"
" "	1 : 250	20 "	Few	"
" "	1 : 250	30 "	"	"
Silver nitrate	1 : 500	30 "	"	Very few.
Thymol	1 : 5000	10 "	Many	Yes.
"	1 : 5000	20 "	None	"
"	1 : 5000	30 "	"	"
"	1 : 10,000	20 "	Many	"
"	1 : 10,000	30 "	"	"

It was thought that by treating the amœba in surface growth as described above where the lower strata are protected by the upper strata of amœbæ and bacteria, the conditions encountered would be fairly analogous to those existing in the intestines, where the amœbæ are protected by mucous and fecal matter. Cases in which the amœbæ have burrowed beneath the surface epithelium need not be taken into consideration in this connection, as no form of local treatment would avail against such conditions.

The above table is, therefore, of interest as suggesting the relative action of several chemicals on artificially grown amœbæ under conditions unfavorable to the complete effect of the antiseptic substances, and therefore not unlike the conditions encountered in the practical use of the chemicals in treating the disease locally in the intestine itself.

It will be noted that quinine, 1:500, had but a moderate effect on the amœbæ in thirty minutes, and 1:250 a decided effect in twenty minutes.

Nitrate of silver, thymol, and succinic peroxide acid in moderate strength exercised a marked effect on the amœbæ, whereas, sulphate of copper, permanganate of potassium, tannic acid, infusion of quassia, ichthyol, and oil of cassia had but slight effect.

In order to determine more accurately the effect of these and other substances on the unprotected amœba, another series of tests was undertaken on the amœba suspended in fluid, and in order to determine whether the deleterious action of each substance was due to a specific action on the amœba or to the destruction or attenuation of its symbiotic bacteria, synchronous transplants were made from the treated culture to sterile agar plates and to others previously inoculated with the cholera spirillum, the symbiotic bacterium of the amœba culture employed.

Uniform suspensions of the amœba were made by pouring 4 c.c. of distilled sterile water over the surface of a forty-eight-hour slant agar culture of the amœba and cholera spirillum, scraping off the surface growth and mixing with the matter, by means of a platinum wire, and pouring the resultant emulsion into a sterile test-tube; 4 c.c of the antiseptic solution (in double strength) to be tested was then added to the 4 c.c. emulsion of amœbæ, thus making a fairly uniform emulsion of 8 c.c. of liquid to one forty-eight-hour slant culture, the mixture containing a definite amount of the chemical to be tested. The emulsion was next thoroughly shaken and allowed to stand for the desired lengths of time, when transfers of one loop of emulsion were made to Petri dishes containing Musgrave's special agar medium, and allowed to develop for forty-eight hours. At the end of such time the plates were carefully examined for amœbæ and bacteria. As stated before, similar transplants were made at the same time to plates previously inoculated with the cholera spirillum. To minimize the concentration of the small quantity of antiseptic carried over with the loop of emulsion, the droplet was spread over a circular area about one-half inch in diameter in the centre of the agar plates.

The following table epitomizes the results of such experiments as were carried out with a maximum degree of uniformity and accuracy. Many more tests than those tabulated were made with each substance, substantiating in the main the results included in the table, but it has not been thought necessary to include them in this report.

By always using the same medium, the same strain of amœba and symbiotic bacteria, checking every culture and every transplant with controls, using cultures of uniform age (forty-eight hours), cultivating transplants for the same length of time (forty-eight hours), and making the amœba emulsions of uniform concentration (8 c.c. water to one slant-culture forty-eight hours old), the relative results are probably as accurate as possible under the circumstances.

TABLE B.

Antiseptic.	Strength.	Time exposed.	Growth of amœbæ after exposure.	Same on plates inoculated with cholera.	Visible growth of bacteria.	Growth of control.
Acid, boric	1 : 50	15 min.	Rich	Rich	Yes	Yes
" "	1 : 50	30 "	"	"	"	"
" "	1 : 50	60 "	Fair	Fair	"	"
" "	1 : 25	60 "	"	"	"	"
" "	1 : 25	2 hrs.	"	"	No	"
Acid, succinic peroxide	1 : 1000	30 min.	Very slight	Very slight	"	"
" " "	1 : 1000	1 hour	None	Fair	Yes	"
" " "	1 : 2000	30 min.	Slight	"	"	"
Acid, tannic	1 : 100	15 "	"	"	"	"
" "	1 : 100	30 "	"	"	"	"
Argyrol	1 : 100	15 "	Very slight	"	"	"
"	1 : 100	30 "	"	"	"	"
"	1 : 100	60 "	None	"	"	"
"	1 : 500	15 "	Slight	.....	"	"
"	1 : 500	30 "	Very slight	.....	"	"
Copper sulphate	1 : 1000	30 "	None	Rich	"	"
" "	1 : 1000	60 "	"	Very slight	"	"
" "	1 : 1000	2 hrs.	"	"	"	"
" "	1 : 2000	30 min.	Slight	Slight	Yes	"
" "	1 : 2000	60 "	None	Very slight	No	"
" "	1 : 10,000	60 "	Fair	.....	Yes	"
Eucalyptol (emul.)	1 : 2000	60 "	"	.....	"	"
Ichthyol	1 : 500	60 "	Slight	.....	"	"
Oil of cassia (emul.)	1 : 2000	30 "	Fair	.....	"	"
" " "	1 : 2000	60 "	Slight	.....	"	"
Protargol	1 : 500	60 "	Very slight	.....	No	"
"	1 : 100	30 "	"	Very slight	"	"
"	1 : 100	60 "	"	"	"	"
Potass. permanganate	1 : 2000	15 "	None	None	Yes	"
" "	1 : 2000	30 "	"	"	No	"
" "	1 : 4000	15 "	Fair	Fair	Yes	"
" "	1 : 4000	30 "	Very slight	"	"	"
Quassia infusion	U. S. P.	60 "	Very rich	Rich	"	"
Quinine sulphate	1 : 500	30 "	None	.....	No	" [1]
" "	1 : 1000	15 "	Fair	Fair	Yes	" [1]
" "	1 : 1000	30 "	Very slight	Very slight	No	" [2]
" "	1 : 1000	15 "	"	Rich	Yes	" [2]
" "	1 : 1000	30 "	"	"	No	" [2]
Quinine bisulphate	1 : 1000	15 "	None	Slight	Yes	" [2]
" "	1 : 1000	30 "	"	Fair	No	"
Silver nitrate	1 : 500	30 "	"	.....	"	"
" "	1 : 500	60 "	"	.....	"	"
" "	1 : 2000	15 "	Very slight	Very slight	"	"
" "	1 : 2000	30 "	"	"	"	"
Thymol	1 : 5000	30 "	Fair	Slight	Yes	"
"	1 : 5000	60 "	None	None	"	"
"	1 : 2500	15 "	"	"	"	"
"	1 : 2500	60 "	"	"	"	"

[1] HCl acid = 1 : 5000.

[2] HCl acid = 1 : 2500.

In examining the above table the following results will be noted:

Boric acid in solution as strong as 1:25 had practically no result on the amœba or the cholera spirillum after an exposure of two hours.

Tannic acid, 1:100 after thirty minutes, had a moderate effect on the growth of the amœba, apparently by attenuation of the symbiotic spirillum.

Succinic peroxide acid exercised a marked deterrent effect on the growth of the amœba by destroying the spirillum, as was demonstrated by the fact that the transfers to cholera plates always con-

tained a much larger proportion of amœbæ than did the synchronous transfers to sterile agar plates.

Nitrate of silver showed a marked destructive effect both on amœbæ and bacteria, 1:2000 applied for fifteen minutes destroying the bacteria and leaving a very slight growth of amœbæ on both sterile and cholera plates; 1:500 destroyed both amœbæ and spirilla in thirty minutes.

Among the colloidal silver salts tested, argyrol as weak as 1:500 applied fifteen minutes exercised an effect similar to that of succinic peroxide acid and protargol, 1:500 applied for one hour, left no surviving spirilla and very few amœbæ.

Eucalyptol emulsion, 1:2000 (with bicarbonate of soda), ichthyol, 1:500, and oil of cassia in emulsion, 1:2000, all permitted a fair growth of amœbæ and cholera spirilla after an hour's application.

Permanganate of potassium, 1:4000, had but slight effect in fifteen minutes, and 1:2000 stopped all growth of amœbæ after an exposure of fifteen minutes, though failing to destroy the spirilla.

Infusion of quassia really seemed to stimulate the growth of the amœbæ, perhaps supplying some nutritive substance from the wood fibres. Quassia was tried because of its former reputation as an injection for oxyuris vermicularis, and upon the theory that the bitter principle might exert a harmful effect on the amœbæ.

Sulphate of quinine, 1:500, destroyed amœbæ and spirilla in thirty minutes; 1:1000 (HCl 1:5000) had a slight deterrent effect in fifteen minutes and a marked destructive effect in thirty minutes; 1:1000 (HCl 1:2500) had the same effect as the solution of half that acidity, except that the growth of amœbæ on the cholera plates was richer in the former. This action was probably due to the accidental transplanting of an unusual number of amœbæ, as the increased acidity would certainly not favor the increased growth of amœbæ.

Bisulphate of quinine did not differ appreciably in its action from that of the sulphate when tested in solution of equal strength and acidity.

Thymol, 1:2500, exercised a marked destructive effect on the amœbæ in fifteen minutes, but failed to destroy the spirillum in an hour. All other experiments with thymol to a dilution as high as 1:5000 demonstrated this specific effect on the amœba, and a failure to destroy the symbiotic cholera spirillum. The specific action of thymol suggests a combination of substances for the local treatment of amœbiasis in which thymol would form the antiamœbic ingredient and one of the silver salts or succinic peroxide acid would form the antibacterial ingredient. Theoretically, such a combination as this or the alternate use of the solutions suggested, should give the best possible results. The possibility of absorbing thymol in toxic amounts in such high dilutions is remote; however, its local effect on the bowel must be tested clinically.

Sulphate of copper, 1:1000, stopped the growth of amœbæ in thirty minutes by destroying the cholera spirilla, and 1:2000 exercised a similar but weaker action in the same length of time.

In view of the general scientific interest awakened as to the use of sulphate of copper in high dilutions as a purifier of water reservoirs, following G. T. Moore's bulletin on that subject (*Bulletin No. 64, Bureau of Plant Industry, United States Department of Agriculture*), an especial series of experiments was undertaken with high dilutions of sulphate of copper on various emulsions of amœbæ. The importance of the subject in connection with the amœba-infected water supply of Manila is very apparent, and was long since recognized by the Board of Health for the Philippine Islands. In compliance with a request from the Hon. Commissioner of Public Health, I reported the results of my experiments with high dilutions of copper sulphate, to the Acting Superintendent of Government Laboratories under date of January 30, 1905. The results are in part as follows: After an application of solution of cupric sulphate 1:5000 for one hour many amœbæ and a few spirilla grew on the transplants; after 1:10,000 for two hours many amœbæ and a few spirilla grew; after 1:100,000 for forty-eight hours many amœbæ and a few spirilla grew. At a later date the above test was repeated under practically the same conditions, except that control transplants were made to cholera plates, and both the amœbæ and the spirilla grew equally well after exposure for forty-eight hours to copper solutions 1:100,000 and 1:200,000.

All the tests mentioned thus far were conducted with amœba emulsions of 8 c.c. of fluid to one forty-eight-hour slant agar culture of amœbæ and spirilla. Another set of tests was carried out to compare the effects of the copper solutions on amœba emulsions of varying concentration. At the same time controls of the emulsions of amœbæ were made, using precisely the same dilutions as those treated with copper, and making transplants from these controls and the emulsions treated with copper, at periods varying from twenty-four to ninety-six hours. It was thus possible to determine by comparison to what extent the destruction or attenuation of amœba emulsions might be due to unfavorable medium, diminished nourishment, etc. The following were the results obtained by treating for ninety-six hours three different concentrations of amœba emulsions with copper sulphate, 1:100,000: 8 c.c. emulsion, transplants developed rich growth of amœbæ and fair growth of spirilla; 16 c.c. emulsion, transplants same as 8 c.c. emulsion; 32 c.c. emulsion, transplants developed few amœbæ and few spirilla.

The 16 c.c. control emulsions with copper omitted gave practically the same results as did those containing the copper, except that the cholera spirillum grew rather feebly in the copper emulsions, but freely in those untreated with copper.

In the 32 c.c. emulsions without copper the growth of amœbæ and spirilla was distinctly better than in those treated with copper. The transplants from the emulsions treated with copper to cholera plates developed a rich growth of amœbæ.

We may fairly make the following deductions from the above experiments: First, that high dilutions of cupric sulphate have practically no effect within ninety-six hours upon concentrated emulsions of the amœba (8 c.c. solution to one forty-eight-hour slant agar culture); second, that copper solutions as dilute as 1:100,000 have little, if any, specific effect on the amœba, though they inhibit the growth of the cholera spirillum to an appreciable extent after an exposure of ninety-six hours, in dilutions as high as 32 c.c. of copper solution to one forty-eight-hour slant culture, and thus impede somewhat the development of the amœba. It is very doubtful, however, whether this inhibiting action on the spirilla is of sufficient potency even in dilutions of 1:100,000 to exercise any practical effect on the development of amœbæ in large bodies of water.

After presenting several tables of experimental data as to the action of "colloidal solutions of copper" on the colon bacillus, the cholera spirillum and other bacteria, Moore makes the following statement in *Bulletin No.* 64, mentioned above: "It is evident that the amount of surface exposed in any ordinary copper tank would far exceed the amount demanded for the above results, and it is likewise certain that after standing from six to eight hours at room temperature in a *clean* copper vessel water becomes safe to drink, even though it may have contained cholera and typhoid germs. It remains to be seen whether or not the application of these facts to conditions in the tropics, where cholera is abundant, will be of any value. It would seem that the construction of canteens and other water vessels from copper might serve as an additional safeguard, if not an actual preventive of this disease, and would prove of considerable value where distillation or efficient filtration apparatus is not at hand."

In accordance with the above suggestions, emulsions of amœbæ and cholera spirilla, of varying degrees of concentration, were poured into clean copper crucibles, covered, and allowed to stand at room temperature in Manila for five days. At the termination of nineteen hours and of five days transplants were made in the usual manner, with the following results:

Emulsion A (4 c.c. to one slant agar culture) developed a good growth of amœbæ and spirilla from transplants made after nineteen hours' standing in the copper crucibles, and a fair growth on cholera plates after five days, though none on sterile agar plates.

Emulsion B (8 c.c. to one slant agar culture) developed a slight growth of both amœbæ and spirilla on sterile agar plates from transplants made after standing five days, and a rich growth of both on cholera plates.

Emulsion C (12 c.c. to one slant agar culture) gave results identical with those of Emulsion A.

It would appear from the above results that it would be disastrous to rely on the action of copper containers to purify water infected with amœbæ or cholera, and that Moore's claim, quoted above, cannot be substantiated, at least as far as they relate to the organisms used in my experiments.

As previously stated in this report, amœba No. 11,524 was chosen as a standard because of its proven pathogenicity and its sturdy resistance to unfavorable conditions. It was taken for granted that any chemical substance that would destroy amœba 11,524 would destroy most other amœbæ, and the few experiments that I had time to carry out in that connection justified the assumption.

The amœbæ employed in these control experiments were No. 39,888, a small intestinal amœba isolated by Dr. Musgrave from a case of intestinal amœbiasis and cultivated in symbiosis with the cholera spirillum, and amœba tap "A," isolated by myself from the Manila water supply, drawing the water from the laboratory tap. The latter amœba was cultivated in pure strain from a single individual, in symbiosis with two or three varieties of water bacteria, among which a yellow pigment-forming bacillus predominated almost to the complete exclusion of the other bacteria.

These two amœbæ were tested with sulphate of quinine, 1:1000 (HCl 1:5000), thymol, 1:5000, succinic peroxide acid, 1:1000, and nitrate of silver, 1:2000, for periods of fifteen, thirty, and sixty minutes, with the result that the destructive effect of these chemical substances was decidedly more marked than in the experiments in which amœba No. 11,524 was the organism employed.

Experiments on old encysted cultures of No. 11,524, one month old, conducted at the same time as the above and with the same solutions, demonstrated the self-evident fact that encysted amœbæ are much more resistant to chemical action than are the free and active forms.

I regret that time did not permit me to pursue my investigations with a larger variety of chemicals and with other strains of amœbæ in symbiosis with various bacteria. However, it may safely be assumed that the results with thymol solutions would be unaffected by such tests as far as they relate to symbiotic bacteria, and it is improbable that any of the common intestinal bacteria usually found in symbiosis with the amœba would resist the action of the silver salts or succinic peroxide acid to a sufficient extent to alter the deductions that may be drawn from the above experiments in which cholera spirilla and water bacteria were the only symbiotic bacteria employed. It should be borne in mind that the entire series of tests was severe on account of the concentration of the amœba emulsions employed, the amœba being present in greater proportion than in the intestinal fluids of severe cases of infection.

RECAPITULATION. Boric acid, eucalyptol, ichthyol, oil of cassia, and infusion of quassia had slight, if any, effect on the amœbæ.

Tannic acid, 1:100, sulphate of copper, 1:2000, permanganate of potassium, 1:4000, and sulphate of quinine, 1:1000, had a distinct moderate deterrent effect on the growth of the amœbæ and cholera spirilla within thirty minutes.

Succinic peroxide acid, 1:1000; permanganate of potassium, 1:2000; sulphate of quinine, 1:500; nitrate of silver, 1:2000; argyrol, 1:500; and protargol, 1:500, exercised a very marked deterrent effect on the growth of the cultures within thirty minutes, and in the case of the silver salts and the succinic peroxide acid the action was plainly due to the destruction or inhibition of the growth of the symbiotic cholera spirillum.

Thymol, 1:2500, applied for fifteen minutes had the unique effect of destroying the amœbæ, while exercising only a moderate effect on the cholera spirilla.

There is no specific treatment for amœbiasis, but if the test-tube results detailed above are a fair index of the behavior of the substances in the actual local treatment of the disease, the clinician can add to his therapeutic armamentarium a few more agents of a value equal or superior to quinine. Such a choice will be appreciated by physicians practising in the tropics when they encounter patients intolerant of quinine, or otherwise failing to benefit by its local action.

PYELONEPHRITIS OF PREGNANCY CONSIDERED FROM THE OBSTETRICAL AND SURGICAL STANDPOINT.

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COMPRESSION of the ureters by the pregnant uterus and the part played by this compression in the production of pyelonephritis is a recently acquired knowledge, and in reality it is only since 1892, when Reblaud related 5 cases, that the exact pathogenesis of the renal lesions has been studied. However, Lohlein and Olshausen had performed autopsies on women who died during labor and found that nearly always there was a dilatation of the ureters. Halbertsma especially studied this lesion relative to its possible relationship to eclampsia, and in quite a number of women who died from this

obstetrical complication he noted a unilateral or bilateral compression of the ureter and believed that this was the usual cause of eclampsia, a theory which, however, is no longer admitted. After the writings of Reblaud pyelonephritis of pregnancy was distinctly individualized, and about a year later Vinay published 2 very interesting cases, and since then a number of other works have appeared on the subject. Three years ago I read a paper at the American Urological Association, in which I reported an instance of pyelonephritis in pregnancy which required nephrectomy, but in the present paper I shall limit my remarks to those cases where obstetrical treatment has been resorted to more or less successfully, and will give a detailed account of an interesting case which has very recently been under my care.

The ureter, after following an obliquely downward course, inwardly and forward, penetrates the small pelvis in front of the sacroiliac symphyses at a point corresponding to the intersection of two lines: one passing in a horizontal direction through the anterosuperior iliac spines, the other drawn vertically from the pubic spine. This point will be found situated 4½ cm. from the median line, and the ureters separated one from the other by a space of 9 cm. At this point the ureter is in direct relationship with the primary iliac artery and vein, which it crosses obliquely, while farther on it passes over the external iliac artery and vein. In the small pelvis the ureters pass through the broad ligament, coming nearer together, but their relationship to the sides of the uterus will alone be considered here. It has been shown by Ricard that a space of about 1.5 cm. separates these canals from the side of the uterus, and it consequently will be seen that when this organ increases in size this relationship becomes nearer. The ureters are 2.5 cm. from the bony pelvic walls. The transversal diameter of the excavation being 12 cm., the 4 middle cm. are occupied by the non-gravid uterus, and in the space of 4 cm. found on each side of this organ the ureters pass at the distance which I have already pointed out. Consequently, the two canals are separated one from the other to the extent of about 7 cm. During pregnancy this relationship is considerably changed. The corpus of the pregnant uterus rises out of the excavation and develops in the abdominal cavity, while at the same time it becomes inclined to one side, usually the right. It also undergoes some torsion on its axis, bringing its left border somewhat forward, so that there is not alone an increase in size, but there is also a change in the direction of the organ. Its relationship to the neighboring viscera is also changed; the ureters are pulled upon and from this their lumen has a tendency to become flattened.

If the ureters of a woman dying during the latter part of pregnancy or immediately after labor are examined they will usually be found dilated, but this dilatation will be present in varying

degrees. Sometimes the ureter may be dilated so that it is nearly as large as the small intestine, but, generally speaking, this is not so excessive in most cases, and the tube will be found to have the diameter of a goose's quill. The dilatation may be bilateral, and when this is the case it is not equal on both sides, and it is always the right ureter which acquires the greatest dilatation, and when only one tube is involved it is usually the right. Of 25 cases of dilatation of the ureters found by Olshausen, in 12 it was present on one side only, and of these 12 instances only twice was the left ureter enlarged. Consequently, the predominance of right-sided dilatation of the ureter becomes evident.

The ureter may be dilated uniformly up to the renal pelvis, while in other cases it may present a series of separate dilatation between which the calibre has remained normal, which gives it a moniliform aspect. The change in size never takes place in the intrapelvic portion of the ureter, a fact which indicates that compression must take place at the superior strait. In the dilated portion the ureter changes its direction. Occasionally it appears elongated and pulled upon, while at the same time it is somewhat flattened. In other cases when the distention is more marked it presents a certain number of flexions, but it may be said that it always undergoes an elongation following the increase in size of the uterus.

If a dilated ureter is open a certain quantity of urine will be seen to escape, but when the tube has emptied itself it never regains its original size, because passive distention has resulted in a decrease of its muscular contractility. The mucosa is hyperæmic, particularly in the neighborhood of the renal pelvis, and in the majority of cases the latter presents a marked increase in size, its aspect being that of a pyramid presenting here and there irregular bosses. The distention of the renal pelvis may reach a very marked degree, but when infection has not become added the walls are not thickened, and the mucosa will be found either normal or slightly hyperæmic. If pyelitis exists the walls of the renal pelvis become thickened and sclerous, while the mucosa is covered by purulent debris and occasionally it will be found entirely hidden by a very adherent puriform layer.

The kidney is ordinarily pale and anæmic, while the medullary substance undergoes marked changes. The tubules are dilated and their lumen obstructed by masses of casts, especially of the colloid variety. The distention of the renal pelvis may produce an atrophy of the renal parenchyma.

Such are the lesions found in cases of compression of the ureter by the pregnant uterus, and it becomes incumbent to explain these lesions. While the pregnant uterus develops its borders come nearer to the ureters, which they displace and push over to the bones of the pelvis, upon which it compresses them. The uterus develops much more to the right than to the left and inclines to the former,

and besides this it undergoes a rotation on its vertical axis and turns in the direction of its greatest development; that is to say, to the right, thus freeing the organs on the left side and exerting a greater compression on those on the right. This explains why the lesions are more apt to be on the right side than on the left.

I have already pointed out that the dilatation of the ureter does not extend lower than the superior strait, and it is at that point where a resisting plane is found on which the excretory canal of the kidney is compressed. In point of fact, above and below the ureter can slide over the soft structures and thus escape compression. A very slight obstacle is quite sufficient to prevent the onward flow of the urine, and this results in dilatation of the ureter. From the experiments carried out on dogs by Halbertsma, the weight of 5 grams compressing the ureter over a surface of 8 mm. is sufficient to prevent the onward flow of a volume of urine weighing 400 grams. The pregnant uterus does not come out of the true pelvis until the end of the third month, and this explains why renal symptoms are not observed before this time.

There are two stages in the evolution of the lesions of pyelonephritis. In the first there is retention of urine in the kidney, which, like the renal pelvis, is distended, and the result is the formation of a urinary pocket. The second stage is represented by infection of this pocket; in other words, we have, in the first place, an hydronephrosis which transforms into a pyonephrosis.

It is generally admitted that the infection reaches the kidney by two principal routes. By the first it extends from the bladder up the ureter to the kidney, in other words an ascending infection, while by the other route, which may be called descending, the bacteria are carried by the blood to the kidney and renal pelvis. The works of the French school relating to retention of urine have thoroughly demonstrated the part played by this retention in infection of the ureters and kidney, but clinically it has been demonstrated that cystitis not infrequently precedes renal infection.

In the second category of facts the infection is transmitted to the dilated renal pelvis by the blood, and it has been experimentally shown that after ligation of the ureters, if one injects cultures of the streptococcus or the colon bacillus, that the hydronephrosis following the ligature of the ureters becomes infected, and in those cases where the streptococcus was inoculated this organism was found in the pus. Consequently, it appears proven beyond a doubt that infection can be carried by way of the blood, but in cases of pyelonephritis occurring during pregnancy, when no intercurrent suppuration arises, it has been proven that the organisms found in the pus are the colon bacillus, as will be seen in several of the cases reported below. Apparently the organism was taken up by the blood from the intestine, which is the habitual nidus for this microbe, and it will also be seen that in two cases gastrointestinal disturb-

ances practically coincided with the general symptoms arising at the commencement of the pyonephrosis, which would seem to indicate that the bacterium coli had a momentarily exalted virulence and thus explains why it was able to enter the circulation. In another case the commencement of the rise of temperature was ushered in by quite severe gastrointestinal disturbances. One may consequently admit that urinary retention, modifying the kidney and excretory canal by lessening their resistance, and, on the other hand, an increase in the virulence of the colon bacillus, which is brought to the kidney from the intestine by the circulation, is the true pathology of the process under consideration. As secondary causes the influence of cold and overwork must be taken into consideration, as they seem to play an important part in two of the cases recorded by Vinay.

Generally speaking, hydronephrosis precedes pyonephrosis and consequently local symptoms mark the commencement of the process. During the fifth or the sixth month of pregnancy, more usually after than before, the patient is seized with a severe pain in the right lumbar region, which may follow the course of the ureters, radiating toward the bladder or even down the thigh. At the same time micturition becomes frequent and may even be painful. In a few cases the general symptoms are first observed, and from the very commencement of the process the patient presents evidences of a septic process. No matter how it may commence a pyonephrosis, when fully developed, presents three principal symptoms—namely, pain, changes in the urine, and the symptoms of a septic process.

The pain is spontaneous and usually increased by palpation and will be found localized in the lumbar region. It also presents exacerbations, occurring in attacks which probably result from retention of urine and pus in the renal pelvis. It may also be intermittent, a fact which may be easily explained by uterine statics, because this organ by becoming displaced from its ordinary position ceases its compression on the ureter, and from this fact retention is done away with and consequently the pain disappears. Some patients may find a position which lessens the pain, simply from the fact that they change the situation of the uterus.

The French school has shown by experimental urinary retention that the pain is due to contraction, which disappears quite quickly within twenty-four or forty-eight hours on account of paralysis of the muscular layer of the ureters, and from this fact one may explain the disappearance of pain, although the process continues its evolution. The pain may extend downward toward the bladder along the course of the ureter and lead to an erroneous diagnosis of cystitis, or it may even extend to the groin and down the thigh.

Bimanual palpation of the renal region will give rise to pain, and occasionally when the patient is lying down, with the legs slightly flexed, renal ballottement may be elicited; but in women who are

six or seven months' pregnant the size of the uterus will usually prevent one from obtaining any data. Under these circumstances the hand should be inserted as far as possible under the costal border, so as to push the uterus forward, but this is always a difficult matter to accomplish, and in the latter months of pregnancy is practically impossible, and then, again, it only gives positive results in cases where dilatation of the ureter and renal pelvis is very marked.

The urine varies very considerably; sometimes there is polyuria and pollakiuria, while on the other hand there may be a very marked decrease in the twenty-four-hour amount, due to the fact that the diseased kidney no longer functionates. Anuria, due to renorenal reflex, may arise. The urine may contain very large quantities of pus, which is easily recognized by ammonia, while a microscopic examination shows white cells in large numbers, occasionally a fairly large proportion of red cells, some casts, and colon bacilli or other bacteria. The presence of pus in the urine gives it a milky aspect, or even a greenish hue, while the production of the pus is usually very considerable and persistent. It may, however, be intermittent, due to the fact that by a change in the position of the uterus the obstruction of the ureter is done away with, or, on the other hand, the latter may be rendered absolute and consequently the pyuria is more or less intense, or may even disappear completely. From the standpoint of the prognosis this intermittence is of extreme importance, because when the diseased ureter becomes completely obstructed the urine voided during this time will be clear and limpid, which indicates that the opposite kidney is normal.

The urinary disturbances markedly influence the general health and not infrequently the process gives rise at its very commencement to serious symptoms, such as repeated and violent chills, accompanied by a temperature which may reach 39° or 40° C. The elevation in temperature may last for several days or even weeks and then disappear or considerably decrease, but usually there is a slight evening rise. The fever may occasionally take on the characters of a hectic fever, presenting those great oscillations which are observed in prolonged suppurative processes. When the suppuration persists the general condition becomes bad after a variable length of time; the patient loses flesh, becomes cachectic, and death will occur if an interference is not resorted to.

Besides the serious forms of pyelonephritis of pregnancy there are milder types, so slight, indeed, that they may even pass by unnoticed, and these are the latent forms which were described by Bredier a few years ago. In these cases there is only one symptom present—namely, a cloudy polyuria, which might be mistaken for a simple albuminuria of gestation, but the ammonia test is quite sufficient to avoid this mistake by revealing the presence of pus.

As to the diagnosis, the most important point is to differentiate a pyelonephritis from cystitis, because very frequently the two conditions have been confounded. For this reason I will rapidly pass in review the symptoms to which they give rise and will show how they vary in the two affections. Cystitis presents three characteristic signs—namely, bladder pain, frequency in micturition, and pyuria—but of these three symptoms only one is common to both cystitis and pyelonephritis—namely, pyuria. In point of fact there may be pain in the region of the bladder in cases of pyelitis, but it is a radiated pain, and the bladder is insensible when palpated. Catheterization is possible and gives rise to no severe pain, while if 200 to 300 c.c. of liquid is introduced into the cavity no pain results, and there is no imperious desire to micturate. Then, again, rectal or vaginal examination is painless. In pyelonephritis micturition may occasionally be more frequent, but this pollakiuria is not painful as it is in inflammation of the bladder.

Pyuria, which is common to both affections, leaves a purulent deposit, the remainder of the urine being generally clear in cystitis, while in the case of renal lesions the urine is milky and remains so. Pyuria is marked and continuous, persisting during the entire micturition in cases of pyelonephritis, while in cystitis it is especially marked at the commencement and at the end of micturition, a fact easily noted by the three-glass test. Thus of the three symptoms of cystitis only one is constantly present in pyelonephritis, the other two being very variable, but if they are somewhat evident it is clear that an erroneous diagnosis may frequently be made. Consequently, every time that a pregnant woman presents pus in the urine and if there is no increase in the frequency of micturition and little or no pain in the region of the bladder, one should immediately examine the renal region to ascertain whether or not a pyelonephritis may not be present.

When the process manifests itself by general symptoms indicating some deep-seated suppuration, accompanied by the presence of pain in the lumbar region, a perinephritic abscess may be thought of, but the local examination will at once put one on the right road to diagnosis. In cases of perinephritic collections of pus a diffused tumefaction will be found in the lumbar region, although no distinct tumor can be made out by palpation, nor can renal ballottement be made evident. And still more, the pain is diffuse, while in pyelonephritis there is a distinct painful point corresponding to the renal pelvis. When the general symptoms are very marked and the pain gives rise to an evident hindrance to the respiration, a pulmonary or pleural lesion may be thought of, but by auscultation nothing is found, and the slow evolution of the disease and the very marked lumbar pain and urinary disturbance will soon cause the true seat of the affection to be located. The diagnosis of pyelonephritis being made, the patient should be carefully questioned as to

her urinary antecedents, in order to ascertain whether a traumatism, tuberculosis, or renal lithiasis may not be in play, and it is only after having eliminated all these causes that a positive diagnosis of a pyelonephritis of pregnancy may be made.

In considering the prognosis the mother and child are to be separately taken into consideration, and the first question that arises is, What are the consequences of the renal process on the health of the woman and the evolution of the gestation? As far as the mother is concerned it is impossible to formulate any general rule, because the progress of the affection varies very considerably from one case to another. For example, Bredier, studying the latent forms of the process, was able to collect 14 cases where the patients were hardly if at all disturbed by their renal lesion, while on the contrary, in other cases, such as I report in this paper, the general symptoms were so serious that the lives of the patients were in danger, and they were only prevented from dying by operative interference. Generally speaking, however, the prognosis is less serious than in the cases to which I refer, and, although the patient may be quite weak, natural labor may be awaited, after which the symptoms disappear all the more rapidly when the pyelonephritis has commenced late in pregnancy. The lesions are not sufficiently inveterate to remain for any length of time after the flow of urine and pus can again take place by a ureter which has become permeable.

It may be queried as to whether or not the pyelonephritis of pregnancy may be the starting point of a chronic nephritis, but in order to answer this question the patients must be followed for a considerable length of time after their recovery, a thing which has, as far as I am aware, not been followed out.

The prognosis as to the evolution of the pregnancy should be extremely reserved, because, in some instances, the intensity of the general symptoms has obliged the surgeon to interrupt pregnancy, while in others the case has ended in a premature labor, but it may be said that pregnancy will come all the nearer to term the later the pyelonephritis has commenced. The prognosis for the child is still more variable, and when a pregnancy goes to term the fetus does not appear to undergo any very serious influence from the maternal renal lesion, but, on the other hand, the child may be born weak and sickly and die shortly after delivery. It would not appear, however, that the vitality of the child is always diminished, because in one case the baby only weighed 2700 grams at birth and nevertheless lived and developed well.

As to the treatment, two cases may be met with. In the first the renal pelvis empties itself by the ureter and the general condition does not give rise to any alarm. On the contrary, we may meet with cases where the kidney ceases to be painful, the retention of pus persists, and the patient's general condition tends to become aggravated. These two evolutions in the process necessitate a different

line of treatment. In the first medical means, such as milk diet and local revulsion may be employed, and a cure is not long in following a spontaneous labor, and this perhaps is what more usually happens. In the second case a more active intervention must be resorted to, the choice being between nephrotomy or the induction of premature labor. Nephrotomy is a serious interference and may result in a permanent renal fistula, and under ordinary circumstances does not appear to me to be the method of choice, because in a large number of cases the renal process will cause a premature labor, after which all the symptoms abate and the patient returns to a normal condition by slow degrees. This is easily explained, because in reality a pyelonephritis merely represents a pocket of suppuration which is poorly drained by a ureter compressed by the pregnant uterus, but when the fetus is expelled the organ returns to its normal size and again takes on its normal relationship to the ureter, the latter recovering its functions of an excretory canal, the flow of the urine becomes re-established, and the evacuation of the pus becomes possible, and little by little a cure is effected.

Now, it would appear to me that it is well to follow the natural course of pregnancy, and in serious cases where surgical interference imposes itself to empty the uterus, which is a relatively simple operation, rather than resorting to nephrotomy, which, in my way of thinking, should be reserved for those instances where obstetrical treatment remains without success. Many cases have been reported where serious accidents have ceased after spontaneous or induced labor. Without any doubt, by interrupting gestation, the child is sacrificed, but in considering the prognosis I have pointed out that interruption of pregnancy not infrequently takes place spontaneously. On the other hand, nephrotomy does not always present miscarriage or spontaneous premature labor, and usually when the lesions are bilateral nephrotomy is contraindicated and then obstetrical treatment must be resorted to. There are, however, cases where nephrotomy must be done, and these are when, in spite of a miscarriage or induced labor, the patient continues to present symptoms of infection, because the kidney is not properly drained, and under these circumstances the renal pocket must be opened and thoroughly drained.

I have particularly insisted on these serious cases where operation is indicated, but I am far from desirous of conveying the idea that I believe all pyelonephrites should be operated upon, because in reality the serious cases are fortunately infrequent. One should know how to temporize, attentively watch his patient, and be ready to interfere should circumstances demand; and in closing, I would say that the degree of fever, the more or less amount of difficulty in the urinary secretion. and the patient's general condition are the guides which will indicate whether or not operative treatment is required.

The following cases taken from the literature are those that I have been able to collect, although in all probability many other instances have been recorded; but those that I here give are amply sufficient to demonstrate that class which may be dealt with from the obstetrical standpoint, because this paper has not been intended to deal with the surgical aspects of this affection, other than to show where the intervention of the surgeon was not required.

Case I. (Potocki). E. S., aged twenty-five years, pregnant about four months; second pregnancy, the first having taken place a year ago, resulted in the birth of a living child, who died at the age of three months from pulmonary congestion. Medical antecedents negative. About three months after the commencement of the present pregnancy the patient complained of slight abdominal pain, while pain at the vulva was very sharp, with frequent desire to micturate. Leucorrhœa was not more marked than ordinarily. Since then the pains at micturition have remained, and then a pollakiuria, with a cloudy urine, developed. A fortnight after the commencement of these symptoms lumbar pain appeared, in the first place on the right and then on the left; the pain was dull, continued, and increased by movement, which obliged the patient to give up work. The pain lasted two days, occurring in attacks and then disappeared, only to reappear two days later. The pain continued for a month with the same character until eight days before coming into the hospital, at which time very severe attacks occurred, requiring morphine. The pain was especially severe on the right side. The patient has become pale and lost flesh, sleep is poor, likewise the appetite, and the tongue coated, marked constipation. Occasional vomiting. Every evening there was a rise in temperature accompanied with slight chill. For a week past intense dyspnœa, but auscultation is negative. The dyspnœa is due to the pain on the right side. Examination showed a generally lax abdomen except at the upper right-hand side, where, on account of the rigidity of the rectus, it is difficult to explore. Bimanual palpation revealed a thickening of the right renal region and produced such pain that the possibility of a perinephritic abscess was thought of. However, as there was no superficial œdema or bulging of the lumbar region a pyelonephritis was diagnosticated. The abdomen was somewhat distended, due to a slight paralysis of the intestine. The uterus, which was painless, had attained the size of a four months' pregnancy, and as nothing could be found by bimanual palpation, the renal process appeared to be alone the cause of the patient's condition. As the patient's condition did not improve by medical treatment, and as the evening temperature rose to 39° or even 40° C., accompanied with slight chill, it was decided to interfere. Examination of the urine showed uric acid and sodium urate crystals, numerous leukocytes, and pavement epithelial cells; it was also markedly tinted with indican and urobilin. Urea was small

in amount, being 8.32 grams; quite marked acidity, showing 40 centigrams of uric acid; 20 centigrams of albumin corresponding to the quantity of pus and the marked amount of urobilin indicated the involvement of the liver. Artificial labor was induced, after which the pain disappeared and abdominal palpation failed to give rise to pain, nor to discover any tumefaction in the renal region. The temperature finally reached the normal and the patient ultimately recovered.

Case II. (Vinay). Patient, aged forty-two years, pregnant for the sixth time. During the seventh month she presented œdema of the ankles and afterward an infiltration of the lower limbs and the abdominal wall. Scanty urine with much albumin. On August 14th a severe pain coming on at intervals was felt in the right side of the abdomen, causing the patient to believe that she was about to be confined, and on account of the pain the patient was obliged to lie on the right side. The urine became purulent, although there was no dysuria, and pressure over the hypogastric region did not induce pain. On September 3d the patient was taken with violent chills, great thirst, and a dry tongue, while the abdomen became painful on pressure, and the general condition seemed to indicate an artificial labor. However, the pains did not come on until 9 o'clock in the evening of September 4th, and the patient was delivered at 11 o'clock of a premature child, which rapidly died. The fever continued for three or four days after the labor and then rapidly disappeared, the urine remaining purulent for some time, but little by little cleared up, and the patient recovered.

Case III. (Vinay). Patient, aged twenty-six years, pregnant for the first time and in the eighth month of pregnancy. Up to this time the general health had been good. On December 8th the patient was exposed to excessive cold and a long tramp on foot, in spite of her advanced pregnancy. In the evening she had a violent chill, followed by three others during the night, and her temperature rose to 40° C. There was no vomiting, diarrhœa, or headache. Urine was scanty and cloudy when voided and contained a large amount of pus. Acid reaction, but no casts or red cells could be found. Micturition was not painful nor frequent. At the same time that these symptoms appeared a sharp pain was complained of in the right renal region, which was exasperated by palpation and prevented the patient from moving. In the evening of the 11th some uterine pains occurred lasting throughout the night, and the patient was delivered at 7 o'clock in the morning with forceps on account of her generally bad condition and loss of strength. The child was alive and weighed 2700 grams. The fever and pain persisted for several days, but finally on the 15th of December it remained at normal and convalescence was rapid. The urine remained purulent, but was voided in much larger quantity, and as soon as the fever had disappeared it began to clear up. Two weeks after labor

the urine no longer contained pus and appeared to be normal. The child was given to a wet-nurse and lived.

Case IV. (Lepage). Patient pregnant for the third time, but complained of pain in the renal region, obliging her to remain in her room for several weeks. Movement of the child was evident on January 20th. On April 18th the patient complained of very severe pain in her right renal region, which, upon examination, was found localized to the right kidney, which was enlarged. Five days later pus was found in the urine and the morning temperature 38° C. Patient was put to bed and revulsives applied to the lumbar region. From April 30th to May 4th the temperature oscillated, showing remissions in the morning. The urine contained pus and the bacterium coli was found. The patient lost flesh, but the fetus developed perfectly. On May 21st, on account of the patient's poor condition and her intolerance for milk, it was decided to interrupt pregnancy; the quantity of urine passed in twenty-four hours was less than 1 litre. On June 7th labor pains began and the patient was spontaneously delivered. After the delivery the temperature dropped and for ten days it remained at about 38° C. and then reached normal. From the eighteenth day on the patient could be fed and began to make flesh. To sum up, one was dealing with a patient in her third pregnancy, who, at the seventh month, developed symptoms of a right-sided pyelonephritis, which resulted in an interruption of pregnancy at eight months and a half. Eight or ten days after delivery the symptoms improved, and a rapid recovery followed labor.

Case V. (Lepage). Patient, aged twenty years, six months pregnant, came to the hospital September 26, 1899, having complained of very intense pain for a week. Temperature 39.9° C. Marked diarrhœa, painful abdomen, serodiagnosis negative. Pain especially marked in the right iliac fossa and increased by pressure. By palpation muscular rigidity was found over the right kidney. Urine quite abundant, cloudy, fetid, and containing pus. The patient's condition remained about the same and the fever continued. On October 5th pressure over the right lumbar region was very painful; there was dulness and tumefaction. Pain on pressure along the course of the right ureter. Labor began October 25th; the membranes were ruptured, and at 5 o'clock in the evening a small child was delivered weighing 1360 grams, but survived. After the labor temperature fell to normal, but the lumbar region was still tumefied and very painful, but the temperature remained normal and there was a progressive improvement, so that the patient left the hospital on November 24th, the urine still showing traces of pus. The child died on November 2d.

Case VI. (Lepage). Patient, aged twenty-four years, menstruated for the last time from June 7 to 12, 1898. At the end of October she was taken with gastrointestinal disturbances, complain-

ing of indefinite pain throughout the lower abdomen, and the first part of November the pain became localized in the left iliac fossa and lumbar region on the same side. Palpation of the left kidney was painful. On November 6th temperature rose to 39.8° C. in the evening and this rise continued. The urine was cloudy and contained 8 grams of albumin to the litre, along with much pus, epithelial cells, and bacterium coli. Local revulsion and milk diet improved the condition somewhat, so that the fever disappeared, but returned at the end of December. At this time there was very marked pain over the right kidney, the temperature went up, and the urine was found cloudy, but passed in large amount. On January 27th it was decided to interrupt pregnancy, on account of the persistency of the fever and the poor general condition. The fetus was deeply engaged and probably compressed the ureters. On February 2d artificial labor resulted in the delivery of a child weighing 2150 grams, who lived. After the labor the temperature became normal, and the patient left the hospital during April, still showing some pus in the urine.

Case VII. (reporter?). Patient, aged twenty years, complaining of pain in the lumbar region. Antecedents negative. Gastrointestinal disturbances with vomiting for three months. Last menstruation at the commencement of March, 1895. In September sharp pain in the right renal region and the urine was found to contain 50 centigrams of albumin per litre. Milk diet. Pain still continued sharp. Patient examined at the end of September. Uterus at about seven months; sharp pain and distinct fulness in the right lumbar region. Milk diet continued and local revulsion over the kidney, with improvement. On October 10th new attack. Urine showed albumin, red and white cells, and casts. Right lumbar region showed all the symptoms of a pyelonephritis. Same treatment. December 14th slow labor with application of forceps at the inferior strait; delivery of a living child weighing 4000 grams. Temperature 39° C. The temperature remained high, so that six days later the uterus was curetted, and in the debris removed was found large numbers of streptococci. Injection of Marmorek's serum. On December 21st temperature was 38.5° C. in the morning and 39° C. in the evening. General condition better. The patient then slowly recovered, the pus and albumin decreasing in the urine, so that she was allowed to get up on January 11th.

Case VIII. (Gebrax). Patient, aged twenty-seven years, entered the service of Dr. Schwartz on February 28, 1901. Patient four months' pregnant, complaining of sharp pains in the right lumbar region. On account of the increase in size of the abdomen, an examination was made difficult, but the right kidney was found larger than the left. Nephrotomy was done on March 5th, revealing an enlarged kidney, which, when opened, was found to have several pockets whose walls were composed of a whitish tissue and

containing a whitish fluid and shreds. The cavity was sutured to the wound and drained. After the operation the patient's general condition improved considerably and the wound healed slowly by granulation, but the patient aborted on May 3d, although no complications arose.

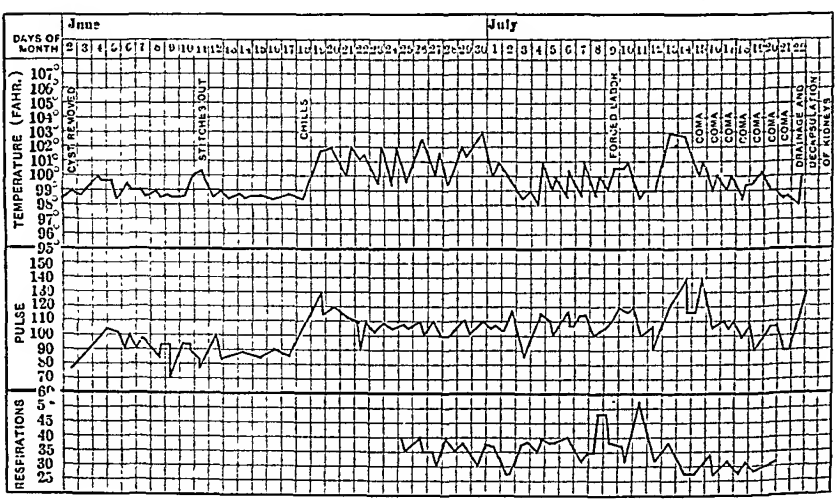
Case IX. (Reblaud). Patient in good health, pregnant for the first time. Until the fifth month of pregnancy she was suddenly taken with severe diarrhœa and fever. The same symptoms continued the next day, but the patient also complained of a severe buccal inflammation. Urine scanty, highly colored, without any deposit. During the day very sharp pain occurred in the right lumbar region and on the next day the urine became cloudy. On the following day the temperature fell, but the right renal region remained painful and the urine contained much pus. A diagnosis of right-sided pyelonephritis was made, and more careful examination of the urine showed a large amount of pus containing a pure culture of colon bacilli. For several months afterward the patient remained in about the same condition. The right renal region remaining somewhat sensitive and the urine contained much pus. The left kidney had never been painful and appeared perfectly normal. Such was the condition of the patient up to the eighth month of pregnancy, after which time she was lost sight of.

Case X. (Reblaud). Patient, aged thirty years, primipara, six months pregnant. For about a month has complained of frequent desire to pass urine, and since this time the urine had become cloudy. Examination revealed large quantities of pus in the urine, but the bladder was not painful. Its capacity being considerable, although micturition was frequent it was not painful, so that the explanation of the morbid phenomena was looked for in the kidney. The left renal region was painless on pressure, and the kidney could not be felt. On the other hand, pressure in the right lumbar region gave rise to pain and the kidney was found increased in size. A careful examination of the urine showed that the deposit was chiefly composed of pus and by the colon bacillus, which bacteriologically proved to be in a pure culture.

Case XI. (Cumston). Patient, aged thirty-seven years, mother of four children, the last one being born five years ago. Was referred to me by Dr. H. F. MacLeod, of Dorchester, the latter part of May, 1905, for diagnosis. The patient had not menstruated for five months, and, although supposing herself pregnant, she did not experience the same discomforts that she had on previous occasions, and at the same time noticed that her abdomen was unusually large for the supposed period of pregnancy. Examination revealed a uterus extending two fingers' breadth above the umbilicus, pushed somewhat to the right, while in the left flank a second growth, the size of a large orange, could be distinctly made out. The diagnosis of a left-sided ovarian cyst complicating pregnancy was made and

operation advised. General examination of the patient at this time was negative in every respect, the urine being perfectly normal.

The patient entered the Dorchester Cottage Hospital, and on June 2d I removed the cyst, the operation taking twenty-five minutes. The patient made a rapid convalescence, the stitches being removed on the ninth day, perfect union having taken place. As will be seen by the temperature chart annexed, the recovery from the abdominal operation was perfectly normal. On June 19th the patient complained of chills, and the temperature was found to have reached 102° and the pulse 110. For the next four days the temperature oscillated between 100° and 102°, the bowels were constipated, the patient had slight chills from time to time, and the tongue became dry and cracked. A blood count and Widal's test were made on June 24th and were negative in every respect. However, from examination of the urine it was found to contain almost one-third its bulk of pus, and submitted to examination, showed that its specific gravity was 1020, color high, urea 25 mg. per c.c., slight decrease in chlorides, pus in large quantities, likewise bacterium coli. The patient also complained of pain in the right renal region, and on palpation the kidney could be felt. During all this time the uterus had continued to develop normally and the fetus was active.



To make a long story short, the patient's condition became more serious. She was drowsy much of the time and gave every symptom of chronic sepsis. As will be seen by the chart the pulse ranged between 100 and 110 or more and the temperature only reached normal on one occasion. Finally, on July 9th, on account of the desperate condition of affairs, it was decided to perform forced dilatation of the cervix and artificial delivery. After this the patient

improved somewhat as to her general symptoms for the next three or four days and the pus considerably diminished. On the fourth day following the delivery the pus again appeared in large quantities in the urine, the temperature again shot up to 103°, and she began to develop still more alarming symptoms of septic poisoning. On July 14th she complained of pain in the left renal region, and by palpation the lower pole of the kidney could be easily detected and was decidedly tender on pressure. The right kidney could also be palpated, but was not tender. The patient was carefully watched, but as an absolute milk diet accomplished nothing, in sheer desperation operation was decided upon, and on July 22d the left kidney was exposed and decapsulated; it was greatly enlarged and intensely congested, but easily decapsulated. The right kidney was then exposed and found considerably disorganized, its pelvis being dilated to four or five times its normal size and contained a large quantity of purulent fluid. This kidney was decapsulated and drainage tubes introduced into the renal pelvis through the parenchyma. The operation lasted thirty-five minutes. The patient stood the operative shock well, but gradually sank and died early the next morning. No autopsy could be obtained, but the right kidney was removed and presented all the macroscopic and microscopic characteristics of advanced pyelonephritis.

TUMOR OF THE CAUDA EQUINA.

By E. Schmoll, M.D.,
San Francisco, Cal.

D. S., aged forty-two years; single; physician; enjoyed good health, with the exception of malaria, until 1894, when he suffered during three weeks with an attack of dysentery.

Three years ago, in May, 1901, the patient noticed the first symptoms of his disease. On defecation he felt a slight pain radiating from the region of the incisura ischiadica major to the posterior side of both thighs and knees. After a few weeks these pains in both legs started independent of the act of defecation at four o'clock each morning, when the patient awakened with a pain, which, increasing in intensity, soon became excruciating. These paroxysms lasted for about two hours, and did not return during the day. The patient thought that this sciatica was due to nervous overexertion, and was confirmed in his view by the fact that after taking a vacation he was entirely without pain during four weeks. After this short intermission the pain returned and persisted in both sciatic nerves. During some months the suffering was bearable; once or twice a

year there would be an acute attack lasting for about six weeks, during which the pain was agonizing. The severity of these attacks could always be mitigated by hydrotherapy and by the administration of large doses of aspirin.

About a year after the disease began rectal crises appeared with extremely painful tenesmus. These crises lasted for about two or three days, and then disappeared for several weeks; during the exacerbations they became more frequent and returned daily without relation to defecation.

During the last few months the process began to ascend, involving the nerve along the crista ilii. The patient described his pain as manifesting itself between the sacroiliacal synchondrosis and the knee on both sides. Only exceptionally did the pain appear below the knee or in the internal region of the thigh.

In the beginning the pain was lancinating in character, with intervals of entire freedom; after one year's duration the pain became of a dull and boring character, with acute exacerbations.

The patient was seen in September, 1904, in one of his attacks; he was well nourished; no anæmia; the differential blood count showing normal conditions; no myelocytes. Slight dulness over both apices, with increased fremitus. On auscultation crackling rales on both sides; no sputum; heart dulness normal; no murmurs; slight arteriosclerosis of the peripheral vessels; liver and spleen normal. Urine without albumin or sugar; without Bence-Jones body.

Pupils equal, reacting to light and accommodation; eye-grounds normal; movements of eyeball normal; no paresis of any muscles; no anæsthesia; no analgesia; reflexes normal, except slightly exaggerated knee-jerks and Achilles reflexes; no foot clonus; no Babinsky; skin reflexes normal.

The only symptom which could be recognized was an excessive tenderness of both sciatic nerves and the two sacroiliac synchondroses. Over the sacrum a point corresponding to about the third sacral vertebra 3 cm. to the left of the median line was extremely tender on pressure, and a circumscribed swelling corresponding to this point of tenderness could be made out. Rectal examination failed to show any pathological changes. Palpation of the sacrum from the rectum did not show any swelling, nor did it elicit any pain.

During the last few months the nerves had become so tender that patient could not lie on his back or abdomen, but for relief was obliged to rest in a kneeling position. In order to sleep the patient knelt on cushions and reposed his head on the bed.

To allay his suffering injections of cocaine were given in the sciatic nerves, which afforded almost complete relief for several hours. The tenesmus was relieved by rectal injections of one-fiftieth of atropine.

In the beginning of October, 1904, œdema of the ankles extending to the knee was noticed, which persisted with but little change for about four weeks. Then the œdema increased very rapidly, extend-

ing to the thigh and then to the scrotum. At the same time evening temperatures of 102° to 103°, that had not been present before, were observed, and the urine began to contain albumin, which rapidly increased in amount until urine with a high specific gravity, large amount of albumin, and very few morphological elements were passed. The daily amount varied between 800 and 1000 c.c., the specific gravity between 1030 and 1035.

Palpation of abdomen and back and of the vertebral column did not reveal any lesions.

The diagnosis had to be deduced from the above-described symptoms and to be based upon the double sciatica of three and one-half years' standing, which was evidently due to either a compression by some new-growth or an inflammatory process communicated to the nerve-sheath. The localization of such a lesion was to be sought in a place where a single focus could involve the roots of the two sciatic nerves at the same time. A localization fulfilling these conditions was supposable in three places: 1. In the conus of the medulla. 2. In the cauda equina. 3. In the sacrum; the process could be caused by a change in the bone, or in the periosteum. The differentiation between lesions of the conus and those of the cauda has been made the subject of extensive study in the last few years, and our knowledge has been most admirably reviewed by Müller.[1] He gives a *résumé* of the most essential points of differentiation in the following table, in which, in a special column, I shall discuss the application to the present case. (See Table I.)

We see by the discussion of the existing symptoms that all the points which allow a differentiation between these two localizations pointed to a lesion of the cauda and permitted the exclusion of a lesion of the conus. We would like to put special stress upon the isolated involvement of the rectum. A lesion occurring in the conus would necessarily involve the bladder centre as well as the rectal centre, the two centres lying so close together that an isolated lesion of one centre only can hardly be conceived.

The differentiation and localization between the caudal lesion and lesion within the bone was an extremely difficult one, as the direct symptoms did not warrant a positive opinion.

In case of a caudal lesion we might have to deal with a tumor or pachymeningitis compressing the posterior roots. In either case we should have expected some involvement of the motor roots, or some anæsthesia showing that we had to deal with an advancing process. On the other hand, pachymeningitis is extremely rare in these regions. A tumor growing within the spinal canal would, as we thought, give rise to symptoms of progressing compression. In this case the symptoms, which practically had not increased since the beginning of the disease, did not show the advance by "étapes," which is so characteristic of the new-growths within the spinal canal. The same consideration has caused Lacquer[6] to diagnose a

tumor situated outside of the dura mater. We could not think at this time of a new-growth having made symptoms for three and a half years without producing any motor paralysis. The probabilities seemed to point to secondary inflammation due to a change either in the bone or in the periosteum.

The nature of the pathological process seemed to be indicated by the tuberculous changes in the lungs; a slowly progressing inflammation of tuberculous nature seemed to have involved the nerves or have lead to formation of cicatricial tissue, which in shrinking caused the compression of the sciatic nerves. This view seemed to be confirmed by the occurrence of œdema, which was not explained by any lesion of the heart or the kidneys. It seemed that an obstruction of the vena cava could best explain the œdema which was slowly advancing from the periphery to the centre, and was only present in the area supplied by this vessel. A compression by cicatricial tissue seemed to be the most probable supposition; the absence of any collateral circulation going to show that this compression was not a complete one.

Because of the rapid increase in the œdema and the intolerable pain, the advisability of an operation to relieve the pressure symptoms was considered. Dr. Stillman, who saw the case with me, shared my opinion, and so we decided to perform a laparotomy, to inspect the vessels of the abdomen, and then to make an incision into the point of maximum tenderness over the sacrum, and to proceed according to the findings. The operation performed by Dr. Stillman revealed a normal vena cava without any signs of obstruction or compression.

The second incision, corresponding to the point of greatest tenderness over the sacrum, showed a dilated vein disappearing into that bone. The roof of the sacrospinal canal was removed, and in the opening so formed a round, deeply injected tumor, banana-like in form, about 6 cm. long and 2 cm. wide, was discovered beneath the dura mater, which formed the floor of the opening. On incision of the dura the tumor was easily removed, and proved on microscopic examination by Dr. Ophuls to be a gliosarcoma of relatively benign character.

The wound was drained. Six hours after operation the patient was perfectly conscious without any pain. On the following day he felt quite well; all the pain and soreness had disappeared, and he rested comfortably on his back. On the third day the patient had some fever and became delirious; in the evening he showed signs of a hypostatic pneumonia. Besides this, the symptoms of incipient meningitis, shown by difference of the pupils, Kernig's sign and general hyperæsthesia, were present. On the fourth day he became comatose and died in the evening.

Dr. Ophuls, to whom I am greatly indebted for communicating his notes, performed the autopsy, revealing general septicæmia, with the presence of Friedländer bacilli in all of the organs,

slight tuberculosis of both apices, pneumonia and purulent meningitis. The examination of the wound showed that the new-growth had been completely removed, and that there was no trace of tumor tissue left. The nerves of the cauda equina were perfectly normal and showed no results of the long-standing compression.

The operation showed that the symptoms of this case were due to the presence of an intraspinal tumor. Apparently the interval between the occurrence of irritation of the posterior roots and the development of further signs of compression in this case is the longest on record. Three and a half years had elapsed between the double sciatica and the time of operation, at which no other symptoms corroborating an intraspinal lesion could be found. Of course, with so large a tumor such an absence of compression symptoms is only possible within the cauda equina, where within a relatively large spinal canal only a few nerves are found.

The œdema could not be accounted for by the findings of the postmortem, and had to be considered an idiopathic œdema, one which cannot be explained by any heart or kidney lesion, or by mechanical conditions. The pathogenesis of it is very obscure; however, we recognize two varieties of this lesion of the peripheral vessels. The first seems to be due to an anatomical change, as demonstrated by the numerous cases, which follow infectious diseases, especially scarlatina; the second is caused by vasomotor disturbance, and constitutes the group described by Osler as angioneurotic œdema. Our case seems to belong to the second variety. Whether the connection is direct or due to some reflect disturbance of the vasomotor centre is hard to say in the absence of any analogous case.[3]

If we compare this observation with the cases communicated by other observers we see that the clinical picture of tumor of the cauda equina is variable, depending upon the site of the tumor. I shall try, by analyzing a few cases, which I am able to find reported in the literature, to develop the clinical appearance of these different forms.

The first case published in modern literature is a tumor of the filum terminale described by Dr. Lachmann.[0] The patient presented some paræsthesia in the legs, an ischuria paradoxa and incontinence of rectum; no anæsthesia; no paralysis. The prominent feature of the case was paralysis of bladder and rectum; no radiating pain; no signs of any posterior nerve-root compression. The presence of a tumor was not diagnosed, but discovered at the postmortem examination.

The second case, which almost resembled our present case, is described by Lacquer.[6] A young man, aged nineteen years, had been suffering from pain in the back and sacrum for the last two years; at night these pains became more acute and irradiated to the knee. At the time of observation, one and one-half years after the onset, the patient did not present any objective symptoms,

Following the first examination an intermission of about two to four months intervened. A new exacerbation resulted in excruciating pains in the legs and pain during urination and defecation. Slight paresis of bladder; paresis of quadriceps muscles; knee-jerk lost on right side, feeble on left; sacrum tender under pressure on both sides. The diagnosis made was that of extradural tumor compressing the cauda equina.

At operation a lymphangioma compressing the cauda equina and situated outside of the dural sac was found and successfully removed. The patient recovered completely.

The third case was described by Valentini.[2] A boy, aged eleven years, suffered for seven months from severe pain in the sacrum. About nine weeks before admission the pain became more accentuated, and three days after his legs became paralyzed; a week following he lost control of the bladder. Upon examination a flabby protrusion could be felt in the region of the third lumbar vertebra. The muscles of the legs were entirely paralyzed, with the exception of the tibialis anticus. Biceps, semimembranosus and semitendinosus weak; quadriceps normal; abductors normal; glutei paralyzed. In all the paralyzed muscles reaction of degeneration. Anæsthesia of nates, perineum, scrotum, and penis. Testicles sensitive, only posterior part of thigh anæsthetic, below knee posterior and lateral anæsthetic; foot completely anæsthetic.

A puncture of the swelling over the vertebra yielded a small piece of tumor, which proved to be a sarcoma. The patient was dismissed.

Fourth case, described by Vollhard.[8] Patient has been aware of the fact for four years that his micturition has been more frequent and difficult. In order to completely empty his bladder, which was easily felt, he had to press with his hands upon his abdomen; in defecating the patient was obliged to use his abdominal muscles to a large extent. Sensation of deep pressure over sacrum; atrophy of the muscles of the left foot and leg. During the whole course of the disease patient never had any pain.

Nervous System. No ataxia; knee-jerk and cremaster reflex increased; Achilles absent on left, present on right; plantar reflex very weak on either side; normal plantar reflex of toes absent; paresis in several muscles innervated by the left sciatic nerve; no anæsthesia. Retention of urine alternating with paradoxical ischuria. Patient died of septic pyelonephritis before operation, which was planned, but could not be done. On postmortem a tumor of the filum terminale was found which corresponded in situation to the diagnosed tumor.

Fifth case; W. Thorburn.[3] Typical anæsthesia of legs, posterior perineum, and penis. The disease began with extreme pain, paralysis of bladder and rectum; at postmortem a tumor the size of a hemp-seed was found in one of the nerve roots of the cauda.

Sixth case, described by Schultze.[4] Disease originated with pain in both sciatic nerves, which continued for two and a half years

without any objective symptoms. At this time paresis in the muscles innervated by the right peroneal nerve set in. Some time afterward crises of the bladder and constipation resulted. Seven years after the beginning anæsthesia in both feet was present. The next year cystitis following paresis of the bladder was noticed; nine years after beginning paralysis of all the muscles of the leg below the knee with the exception of the tibialis anticus and extensor hallucis longus was noticed, showing the reaction of degeneration. Achilles reflex absent on the left side; paresis of biceps and glutei.

Twelve years after the beginning both biceps femoris muscles showed reaction of degeneration; paresis of the bladder and rectum; knee-jerk could be obtained only by Jenderassik's method; anæsthesia in the whole sacral plexus, perineum, scrotum, and penis. A year afterward knee-jerk lost. Diagnosis was made on tumor of cauda, and operation revealed a tumor extending from the second vertebra to the sacrum. It was too large to be entirely extirpated, and the patient died a few days later. On postmortem it was demonstrated that the tumor had invaded the whole bony sacrum.

The seventh case was described by Gowers.[5] A man aged twenty-eight years, whose symptoms commenced nine months before death and consisted of severe pain in both legs, and progressive weakness; the power of standing was lost about four months after the onset. Very little power in the flexors of the hip; extensors of hip slightly paretic; knee-jerk absent; all muscles of the leg considerably atrophied; extreme atrophy of the muscles below the knee; no reaction of degeneration. Tactile sensibility was impaired in each foot and lower leg, more so in the right, and chiefly in the region supplied by the sacral plexus; sensibility to pain not affected. The bladder was involved early and symptoms of pyelonephritis already existed. The kidney disease was the immediate cause of death. At postmortem a fibrosarcoma of the cauda involving many nerve roots was found.

Case eight, described by Selberg.[7] Patient, aged twenty-four years, had suffered a trauma in the region of the sacrum. Six months afterward she began to complain of backache, which prevented her from sitting down for any length of time; shortly afterward she began to claudicate. The clinical picture was completed by signs of retention of urine.

On examination the muscles innervated by the left sciatic nerve were found to be paretic; on both sides absence of knee-jerk; extreme tenderness of sacrum. The diagnosis was made on a tumor compressing the cauda equina in the height of the third, fourth, and fifth lumbar nerves.

Operation showed a very large tumor, which could not be entirely extirpated; patient died soon after operation. Postmortem revealed tumor reaching up to the twelfth dorsal vertebra, consisting of sarcomatous tissue.

To allow a comparison between the different cases we have tried in the accompanying tables to give a short recapitulation of the principal symptoms and their relationship. (See Table II.)

It has been attempted to establish from the existing cases the symptomatology of caudal tumors. It is very obvious that, like tumors in other portions of the spinal column, those of the cauda equina do not present one invariable set of symptoms, but they must be classified in various groups. The clinical appearance will vary with the nature of the tumor, with its size, rapidity of growth, and location. If we consider the above-described cases we see that they represent three different clinical entities. A first group contains the cases of Lachmann and Vollhard; the tumor originated here from the filum terminale. In both cases we find absence of the initial neuralgic pain, which otherwise is so indicative of caudal lesion. They began with bladder symptoms, which, in the cases of Lachmann, constitute the principal symptom during the whole progress of the disease, and are only completed by paræsthesias within the sciatic nerve areas.

In Vollhard's case the clinical history is completed by paralysis of several muscles innervated by the sciatic nerve. Characteristic of these cases is the disturbance of bladder combined with the symptom indicating a lesion of the sciatic nerve, and an absence of neuralgic pain, which is best explained by the theory suggested by Vollhard. The tumor originating from the filum terminale and situated at the anterior side of the conus will first compress the motor roots against the bone, while the conus would protect the sensory roots from any direct pressure.

A second group constitutes cases originating in the bone and involving secondarily the cauda equina (cases of Valentini and Selberg). In these the development is comparatively rapid (nine and eighteen months), and the clinical history contains all the symptoms supposed to be characteristic of caudal lesion.

They begin with neuralgic pain in the sacrum and both sciatic nerves; they show anæsthesia in the region innervated by the sacral plexus, paralysis of muscles supplied by the sciatic nerves and disturbance in the function of bladder and rectum. The clinical evidence of a caudal lesion so completely present in these cases, combined with the local findings on the vertebral column, allow of relatively easy diagnosis. The rapid development, the completeness of the caudal symptoms are the characteristic features of these cases.

A third group comprises the cases of Gowers, Schultze, Lacquer and the case described in this paper. Gowers' case, which is not fully described, cannot be used for the drawing of the clinical picture; but the other three cases present such a uniform and concordant clinical history that the diagnosis in analogous cases should be made. All three cases begin with a double sciatica and dull pain in the sacrum. In all cases the pain is described as an intolerable one, and in the cases of Lacquer and Schmoll is charac-

terized by nightly exacerbations; a fact which, to my mind, can be best explained by the extreme vascularity of these tumors; the lying position produces passive congestion of the tumor, which increases the compression of the sensory roots. This double sciatica, as a rule, remains an isolated symptom from one, two, to three years, until the bladder and rectum symptoms declare themselves either in the form of slight paralysis of these organs or in the form of neuralgia-form crises. At the same time or later on anæsthesias and paralysis of the muscles innervated by the sacral plexus may appear.

These three clinical forms correspond to three different localizations and modes of development of the cauda tumor. The first group presenting bladder and rectum lesions, paralysis and anæsthesia in the sciatic nerve, corresponds to a slowly growing central tumor just below the conus. In these cases the differentiation from tumors of the conus terminales will be especially a different one, and can only be made by the development of the different symptoms.

The second group comprises the tumors of great malignancy, mostly originating from the bone; they present the complete classical picture of the cauda lesion, and their clinical appearance will only vary according to the situation and development of the tumor.

The third group constitutes the cases of slowly growing tumors developing within the roots of the cauda. Characteristic of these cases is the double sciatica eventually combined with anæsthesias, or paralyses within the region of this nerve, and symptoms of bladder

TABLE I.

Points of differentiation.	Conus.	Cauda.	Present case.
Development of case.	Mostly in a few days: myelitis.	Very slow in case of tumor, acute in cases of trauma.	Development has been very slow.
Symptoms of irritation of sensory roots.	Mostly absent.	Of very great intensity, radiating in sciatic and bladder region.	Radiating pain in the sciatic nerves and rectum are pronounced symptoms.
Symptoms of sensory paralysis.	Occur early in the clinical picture; often in the form of dissociated anæsthesia.	Occur late in the clinical history, and then in the form of complete anæsthesia.	No anæsthesia.
Symptoms of motor paralysis.	Originate early; atrophy, reaction of degeneration.	Occur only after a long period; reaction of degeneration occurs slower.	No motor paralysis; speaks for caudal lesion.
Relation of sensory to motor paralysis.	Motor paralysis paramount in clinical symptoms, anæsthesia not pronounced in clinical picture.	Preponderance of sensory irritation.	No motor paralysis; very severe sensory irritation indicating caudal lesion.
Disturbance of bladder and rectum.	Bladder and rectum always paretic or paralyzed; genital reflexes sometimes present.	Disturbance of these organs resemble caudal lesion.	Isolated crises of rectum without bladder symptoms practically exclude conus lesion.

TABLE II.—TUMORS OF THE CAUDA EQUINA.

Case.	Duration.	Symptoms of sensory irritation.	Anæsthesias.	Symptoms of motor irritation.	Paralysis.	The relation between sensory and motor symptoms.	Disturbance of bladder and rectum.	Findings at post-mortem.
Lachmann,	About 6 months	None.	Slight paræsthesias in legs.	None	None.	.....	Ischuria paradoxa and incontinentia recti.	Glioma of the filum terminale adjoining the cord.
Lacquer,	1½ years	Excruciating pain in the sacrum irradiating to the knee, worse at night with entirely free intervals.	None.	None	Slight paralysis of quadriceps; knee-jerks lost on left side.	Motor paralysis about two years after sensory symptoms.	Slight paralysis of bladder.	Lymphangioma extirpated; patient got well.
Valentini,	7 months	Severe pain in back, especially sacrum.	Anæsthesia of both legs corresponding to the two sciatic nerves.	None	Paralysis of the calf-muscles and left out-flexions of tibia weak.	5 months.	Paralysis of bladder.	Sarcoma of the lumbar vertebra.
Vollhard,	4 years	No pain.	None.	None	Paresis of several muscles innervated by the left sciatic.	.....	Started in with paresis of bladder and rectum.	Tumor of the conus terminalis. Died before planned operation.
Schultze,	13 years	Pain in both sciatic nerves.	Complete anæsthesia in the whole plexus sacralis.	None	Paralysis of the whole leg.	1½ years.	Paresis of bladder and rectum.	Tumor of the second lumbar vertebra, extending down to the sacrum. Died three days after operation.
Gowers,	9 months	Pain in both nerves.	Anæsthesia in places innervated by the sacral plexus.	None	Paralysis of both legs.	.....	Paralysis of bladder and rectum.	At postmortem tumor just below the conus.
Thorburn,	9 months	Pain very severe.	Typical anæsthesia of nerves and legs.	None	Paralysis of muscles innervated by sciatic nerve.	.....	Paralysis of bladder and rectum.	Small tumor involving some nerve roots.
Selberg,	18 months	Backache.	Typical anæsthesia.	None	Paralysis of muscles innervated by ischiatic.	About 3 years.	Paralysis of bladder and rectum.	Tumor of the twelfth dorsal reacting to the sacrum.
Schmoll,	3½ years	Excruciating pain, irradiating down to the sacrum; worse at night.	No anæsthesia.	None	None.	.....	Crises of rectum.	Gliosarcoma comprising three-ninths sacral nerves first three days after operation.

or rectum lesion. On account of their easy accessibility, their superficial position, these cases constitute the most favorable field for surgery of the central nervous system.

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THE SPIROCHÆTÆ FOUND IN SYPHILIS.[1]

A REPORT OF THIRTY-FOUR CASES.

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ANY discovery which seems to bring us nearer to the specific cause of a disease is hailed with great enthusiasm. Usually such discoveries are based upon the study of but few cases, and, in the majority, the results are not supported by extended observations. Recently, it has been maintained that the cause of syphilis has been discovered, and it appears, from the number of successful results obtained by others than the original discoverers, that something definite has been achieved.

Schaudinn and Hoffmann[2] call attention to a very delicate organism which they found constantly in syphilitic lesions, and which they term the spirochæta pallida. Occurring with this parasite was another, a larger, darker organism, the spirochæta refringens. They found these parasites in the juice of glands, chancres, and flat condylomata. Material from these sources was examined fresh and in stained preparations. The spirochæta pallida is described as being extremely difficult to see in the fresh state and very refractory to stains. It varies in length from 4 to 14μ, the width from an immeasurable thickness to five-tenths of a micron, and the number of bends or curves from 3 to 12. It is motile,

[1] Read by title at the Pathological Society of Philadelphia, October 26, 1905.
[2] Arbeiten aus dem Kaiserlichen Gesundheitsamte, Berlin, April 10, Heft 2, p. 527.

showing a rotary motion, forward and backward, and a bending of the entire body. There is said to be a suggestion of an undulating membrane, but no flagella; the ends are pointed quite sharply. The spirochæta refringens was found in non-syphilitic lesions, while the spirochæta pallida was not.

Three years previously Bordet and Gengou had observed the same organism in the initial lesions of syphilis, but not finding them constantly, they discontinued their observations.

The first studies of Schaudinn and Hoffmann embraced 26 cases of syphilis. In every case they found the specific organism. Schaudinn[1] in a later communication found the parasite in the deeper layers of primary lesions, inguinal glands, and in the splenic blood obtained one day before the appearance of roseola. He says that in general morphology it is a thin, spirally twisted thread, and there is seen an undulatory movement pass along the whole structure, expressive of an undulatory membrane. With this are associated bending, snake-like, and whip-like movements of the whole body from which spirillæ differ in that they have a rigid long axis. It also differs from the spirillæ in its minute size, its delicacy, and its refractility. The spiral turns are numerous, regular, and deep, and they hold this morphology in stained preparations. He was able to demonstrate the parasite in 12 cases of typically syphilitic glands (inguinal). It was often found only after a very diligent search, and he was not able to find the spirochæta pallida in bubo following soft chancre, nor in carcinomatous or tuberculous tissue. In a male who exhibited no syphilitic phenomena for nine years, he found large spirochætæ in an erosion of the glans penis. Hoffmann[2] was able to demonstrate spirochæta pallida in the liver, spleen, inguinal glands, and the fluid from pemphigus bullæ seven hours after death in an infant dead of congenital syphilis. The same observer[3] in 2 cases of superficial cancer and 1 cervical carcinoma found spiral organisms which were of considerable size, thickness, and few curvès. He was unable to identify the spirochæta pallida in these lesions. Metchnikoff and Roux[4] in 6 apes inoculated with syphilis found the spirochæta pallida in the initial lesions upon the genitalia of 4. They further state their belief that its presence is diagnostic. Zabolotny[5] was able to isolate a spirochæta from the contents of enlarged glands and from excised papules of secondary syphilis. In 13 of 29 cases the organism was present. The glands contained only a few, while in the papules and roseola they were present in great numbers. In the smears from the glands peculiar rounded bodies staining light blue were found, the exact nature of which could not be determined. He seems to think that the spirochæta pallida plays a part in producing the lesions of

[1] Berl. klin. Woch., May 29, 1905.
[2] Ibid., 1905, No. 23.
[3] Ibid., 1905, No. 28.
[4] Bull. de l'acad. de méd., May, 1905, p. 468.
[5] Roussky Vratch, June 4, 1905.

syphilis, but that as yet we do not know whether the organism represents a transition form of some parasite or whether it alone is the essential causative factor. McWeeney[1] reports finding the parasite in enormous numbers in syphilitic lesions and concludes that it may be etiologically connected with the disease. He further states that it seems important to make careful search for it in deeply situated lesions beyond the reach of surface contamination and to establish its absence in non-syphilitic ulcers of the genital tract.

Horand[2] in the blood obtained from an arm vein of a syphilitic child found numerous active needle-like bodies undulating like spermatozoa. In initial lesions, bloodvessels, lymphatics, mucous patches, secondary and tertiary lesions the following structures were observed: 1. Sporulated bodies, especially numerous in mucous patches. 2. Colored granules which were very motile. 3. Refringent bodies in the red globules and around them. 4. Amœboid cells. 5. Crescents. 6. Needle-like forms or flagella darting in all directions. 7. Bodies *en masse*. 8. Bodies in rosettes. 9. Isolated spheres. 10. A parasite in its stage of perfect development. 11. Red globules containing granules. 12. White globules containing pigment. He concludes that the pathogenic agent of syphilis is a parasite of evolution, a protozoön, or better a "hæmoprotiste."

Vuillemin,[3] in remarking upon the presumed agent of syphilis, proposes the name "spironema pallida" for the spiral protozoa with sharp ends, which differ from the trypanosomes in the appearance of the undulating membrane and its flagelliform prolongation. He claims that it is regrettable that the probable organism of syphilis called by savants spirochæta pallida should be presented to the public under that term as this name was created in 1833 by Ehrenberg for the spirochæta plicatilis. Further, he claims that the affinities of the organism should be sought in the direction of protozoa.

Levaditi,[4] in two infants, congenital syphilities, observed the spirochæta pallida in the bullæ upon the hands and feet of one, and in the liver and spleen of the other. He thinks that the disease, congenital syphilis, is a spirillosis presenting more points in common with recurrent fever in man and spirilloses of fowls, including geese. Galli-Valerio and Lasseur,[5] in several cases of syphilis exhibiting condylomata and mucous patches, found spirochætæ in the majority of instances. He states that the organism not being encountered in some cases does not speak against its specificity, because in a certain number Schaudinn personally found only a few organisms. Mackenzie[6] asserts that in recurrent fever and syphilis ocular lesions are very frequent, and insists upon the difficulty of diagnosis between these maladies, as they are both spiril-

[1] British Medical Journal, June 10, 1905.
[2] Lyon méd., February 21, 1904, p. 847.
[3] Compt.-rend. de l'acad. des sci., June, 1905, No. 23, tome cxl. p. 1567.
[4] Compt.-rend. de la Soc. de biol., May 26, 1905.
[5] Rev. méd. de la Suisse Romande, July, 1905, p. 487.
[6] La Presse méd., May 27, 1905, No. 42, p. 840.

loses. Jacquet and Sevin[1] were unable to identify the spirochæta pallida in a great number of cases showing secondary and tertiary manifestations. Hoffmann[2] found in the liver and spleen of a child dead of syphilis numerous spirochæta pallida, which were also present in the bullæ and inguinal glands. In papules distant from the lesions the organism was also found. Flexner and Noguchi[3] found spirochætæ in 3 cases of syphilis, while in 2 non-syphilitics they could not demonstrate the parasite. Hexheimer and H. Hubner[4] in 15 of 16 cases demonstrated the spirochæta pallida; in one instance they identified it in sections of tissue. They failed to find it in syphilitic glands, in the blood, or in the organs of congenitally syphilitic children. Kiolomenoglou and von Cube[5] discuss the occurrence of spirochæta pallida in syphilitic lesions, but they consider it quite as important to confirm the absence of it in non-syphilitic lesions. They found the organism in a collection of syphilitic cases, in the secretion of an inflamed phimosis, in gonorrhœal pus from an abscess of Bartholin's gland, in simple balanitis, in pus from a scrofulodermatic abscess, in the degeneration products of a suppurating cancer, and in tissue juice of condyloma acuminatum. Negative results were obtained in acute gonorrhœa, syphilitic blood, acne vulgaris, impetigo, and phthisical sputum. They found the spirochæta refringens in all the above cases as well as the spirochæta pallida, and in addition numerous atypical organisms whose characters corresponded to neither of these. "It must be remembered that we have found spirochæta pallida in stagnant secretions as smegma, and the idea that it may also be saprophytic is not to be put to one side."

Rille[6] found the spirochæta pallida in 6 cases of syphilis; in 3 primary lesions in the male and 1 in the female, in the primary lesion of the coronary sulcus, and in a papular efflorescence of the forearm. Pflaeger[7] claims that the organism is found in syphilitic tissue only; it is small, delicate, refractive, having pointed ends without flagella, occasionally nuclei or undulating membrane. He demonstrated the parasite in the blood of roseola, and noticed motility six hours afterward in salt solution, while this property was destroyed in from five to ten minutes in glycerin.

Jensen[8] found the organism in the fluid from a hard ulcer and lymph gland, two ulcerated and one non-ulcerated papules. Raubitschek[9] was able to demonstrate the parasite in the blood and the fluid of one broad condyloma. The blood was taken from the finger-tips and stained by the ordinary methods. Buschke and Fischer[10] found in spreads from the liver and spleen of a child dead

[1] La Presse Méd., May 24, 1905, No. 41, p. 338.
[2] Berl. klin. Woch., June 5, 1905.
[3] Medical News, June 17, 1905, p. 1145.
[4] Deut. med. Woch., June 29, 1905, No. 26.
[5] Münch. med. Woch., July 4, 1905, No. 27.
[6] Ibid., No. 29.
[7] Ibid.
[8] Deutsch. med. Woch., 1905, No. 30.
[9] Wien. klin. Woch., 1905, No. 28.
[10] Vorgetragen in der Aerzte Gesellschaft des Krankenhauses am Urban, May 11, 1905.

of congenital syphilis the spirochæta pallida, but were unsuccessful in demonstrating it in the living subject. In a later communication[1] they succeeded in finding the parasite in the blood during life. Babes and Panea[2] in the blood of two cases of congenital syphilis were able to find the spirochæta pallida, while in a third case no organisms were found in the blood, liver, or spleen. In the two positive instances it was also demonstrable in the mucous membranes, bone-marrow, thymus gland, conjunctival secretion, arachnoid fluid, lymph glands, liver, spleen, kidney, and adrenals. C. Fraenkel[3] in six syphilities was able to identify the spirochæta pallida in all, and also saw the same organism in a non-specific lesion. Spitzer[4] identified the organism in 7 exanthemas, 2 ulcerated lesions, and in 6 cases of sclerosis; in non-ulcerated gummata, in mucous patches, and in non-specific lesions. Wechselmann and Lowenthal[5] observed motile spirochætæ in various specific lesions, and believes that it is important to find the organism in regions distant from the genitals. Bandi and Simonelli,[6] in examining a millimetre-sized plate of skin, claim they found at the depth of these plates large cells with apparently degenerated protoplasm and containing the spirochæta pallida in their nuclear substance. They assert that this fact is very important and corresponds to what is seen in tuberculosis, leprosy, and glanders; that it is a true cell parasite and seems to show the nature of syphilitic lesions. Omeltschenko,[7] examining the scrapings of both hard and soft chancres, dry and moist syphilitic papules and other granulating surfaces of a non-specific nature, found in every preparation beautiful spirals of elastic tissue "which corresponded to the spirochæta pallida and spirochæta refringens." In every preparation the author purposely scraped the tissue of the corium. No typical difference of any sort could be detected between the spiral fibres and the organisms when stained with Giemsa's stain. In addition, the author examined the blood of syphilities when condylomatas were present, obtained by applying a leech and collecting the drops which exuded from the wound after the leech had been removed. In no case was he able to demonstrate spirochætæ. Nigris[8] succeeded in demonstrating the spirochæta pallida and refringens in the blood from a maculopapular efflorescence on the foot of a two-months-old syphilitic child. In the serum from a blister over the eruption only the spirochæta pallida was found. Richards and Hunt[9] remark that in the examination of "venereal sores" they found in films made from scrapings the organism described by Schaudinn and Hoffmann. It appeared to occur in three forms, presumably involution forms of the same organism, differing only in thickness, length, and the

[1] Deutsch. med. Woch., 1905, No. 21.
[2] Berl. klin. Woch., 1905, No. 28.
[3] Münch. med. Woch., 1905, No. 24.
[4] Wien. klin. Woch., August 8, 1905.
[5] Med. Klinik, 1905, No. 26.
[6] Münch. med. Woch., 1905, No. 35.
[7] Roussky, Vratch, July 23d; New York and Philadelphia Medical Journal, September 30, 1905.
[8] Deut. med. Woch., September 7, 1905, No. 36.
[9] Lancet, September 30, 1905.

number of spirals; one form being thick and straight or slightly curved, a second of the same thickness as the first, but with spirals, and the third exceedingly thin, distinctly spiral, with a large number of turns and very long. The first two varieties appeared to exist in the secretion and the superficial part of the sore, while the third variety occurred in the deep scrapings only. In 3 cases in the secondary stage with the rash of a few days' duration, stained films contained an organism like the fine one found in the sore. In one patient the organism was seen in the blood film taken on each of ten successive days, and in 3 cases in which the organism was found in the blood it had previously been seen in all forms in the primary lesions.

Fanoni[1] reports upon 5 cases of syphilis in which he demonstrated the spirochæta pallida in scrapings from chancres, condylomas, and papules. Gordon,[2] in 8 specimens of cerebrospinal fluid obtained from cases of cerebrospinal syphilis, was unable except in a single doubtful instance to demonstrate a spirochæta.

Metchnikoff[3] claims that syphilis is a chronic spirillosis due to the spirochæta pallida of Schaudinn, is pathogenic to the human race, for the anthropoid apes, and for certain varieties of inferior monkeys or apes. He further states that the organism is not the same as the one found in the smegma of the prepuce or upon common ulcerations.

Tchlenoff[4] studied 14 cases of syphilis in which he examined the secretion of chancres, contents of inguinal glands, and papules. In all specimens of hard chancre he found the spirochæta pallida. He distinguished other spiral organisms by their usually deeper staining properties and the smaller number of their spiral turns.

Technique.

Schaudinn and Hoffmann recommended for staining the spirochæta pallida azur-eosin (Giemsa) prepared according to the following formula: Azur No. 1, 1:1000; azur No. 2, 8:1000; eosin (water soluble), 2.5 of 1 per cent. soluble in 500 c.c. of water.

The staining mixture should be made up fresh as desired, and for this purpose 12 c.c. of the eosin solution are mixed with 3 c.c. each of azur No. 1 and No. 2. The material to be examined is spread upon a slide or cover-glass fixed with absolute alcohol for ten to twenty minutes, and the stain applied for sixteen to twenty-four hours, it is then washed thoroughly in water, dried, and mounted in balsam. Numerous modifications of this formula have been suggested, and Schaudinn in a later communication recommends one in which 35 drops of Grübler's Giemsa mixture are added to 20 c.c. of water.

[1] Medical News, October 7, 1905.
[2] American Medicine, July 22, 1905.
[3] La Presse méd., May 27, 1905, No. 42, p. 340.
[4] Roussky. Vratch, June 18, 1905; New York and Philadelphia Medical Journal, August 12, 1905.

Giemsa personally claims that the optimum time for staining with azur-eosin is one hour. In another paper Giemsa[1] stains with azur-eosin made with glycerin and methyl alcohol. After fixing in absolute alcohol he applies the stain for fifteen minutes. A better definition is claimed to be given to the organism if a 1 per cent. solution of carbonate of potassium is mixed with the water before the stain is diluted.

Gonder and Hoffmann stained the organism with fresh aniline gentian violet for twenty-four hours. Babes and Panea recommend the classic Romanowsky mixture applied for at least fourteen hours.

Davidsohn[2] uses kresyl violet R. extra of Muhlheimer for from one to forty hours. He claims that the less manipulation indulged in the better the results.

Oppenheim[3] prepares a thin film of material on a cover-glass, dries in air, and without any further fixation applies an alcoholic solution of carbol gentian violet (5 per cent. watery carbolic acid 100 c.c.; concentrated alcoholic solution of gentian violet 10 c.c.). Heat is gently applied until steam arises, then wash in water carefully, dry with filter-paper, and mount in balsam. Spirochætæ are stained blue. Spitzer recommends Giemsa's azur-eosin to be applied for six hours, and claims that it is harmful to permit it to remain too long, as the color becomes a faint green, Bandi and Simonelli obtained excellent results with Giemsa's azur-eosin when allowed to act for from twelve to twenty-four hours, and was also able to demonstrate the parasite with Ziehl's carbol-fuchsin.

McWeeney claims that with carbol-fuchsin acting for an hour he obtained poor results, while with Giemsa's azur-eosin the organism was stained a distinctly reddish violet. Other bacteria in the preparation were stained blue.

Zabolotny, after fixing in 5 per cent. solution of carbolic acid, stained with azur-eosin heated for fifteen minutes. Hexheimer and Hubner stain with Niblau B. R. or capriblau in 1:1000 aqueous solution for from sixteen to twenty-four hours.

Pflaeger used carbol gentian violet without fixation for one minute and washed in water, dried in air, and mounted in balsam. He claims that the spirochætæ are apparent under a magnification of 800.

Dudgeon[4] demonstrated the organism with Leishman's stain as follows: A few drops of a 1 per cent. solution of Leishman's powder, in absolute methyl alcohol, is placed upon the spread and allowed to fix and stain for thirty minutes, then add double the quantity of distilled water and stain for five minutes longer. Pour off excess and allow distilled water to act for one minute; the surplus and any precipitate remove with cigarette paper, dry and mount in balsam.

Reitman[5] recommends after drying the preparation in the air,

[1] Deutsch. med. Woch., 1905, No. 26.
[2] Berl. klin. Woch., 1905, No. 33.
[3] Deut. med. Woch., 1905, No. 29.
[4] Lancet, August 19, 1905.
[5] Deut. med. Woch., 1905, No. 25.

fixing in absolute alcohol for ten minutes, water five minutes, 2 per cent. phosphotungstic acid, washing this off with 70 per cent. alcohol. The preparation is then stained with ordinary carbol-fuchsin by heating over the flame until steam arises, wash in running water, pass through 70 per cent. alcohol, and wash in water until no more color is given off. Dry and mount in balsam. The spirochætæ are stained intensely red, the nuclei dark, and the protoplasm light.

Marino[1] makes up a mixture of methylene blue and azur as follows: methylene blue, 0.5 gm.; azur, 0.5 gm.; water, 100 c.c. Add an aqueous solution of carbonate of soda (0.5 per cent.) and after standing for twenty-four to forty-eight hours at 37° C. add an aqueous solution of eosin. Filter and obtain the filtrate. Dissolve 0.04 gm. in 20 c.c. of pure methyl alcohol. An eosin solution is made by adding 0.05 gm. to 1000 c.c. of water. Four drops of the first stain are applied to the cover-glass for three minutes, rocking the preparation constantly, then without washing in water apply 8 to 10 drops of the eosin mixture. Allow this to remain for two minutes, wash in water, dry, and mount in balsam.

Bordet and Gengou stain with Kühne's carbol methylene blue and follow with Nicolle's carbol-gentian violet. Galli-Valerio and Lasseur stain with azur (Michaelis) for from nine to twelve hours after drying the preparation and fixing in the flame. They claim that the preparation stained with azur and mounted in balsam decolorizes rapidly. Metchnikoff and Roux obtained excellent results by Giemsa's stain in from six to eight hours by Marino's method, and with a solution of azur in methyl alcohol and a feeble solution of eosin.

L. Lesourd,[2] after fixing the spread in ethyl alcohol for two or three minutes, dries and stains with Giemsa's mixture diluted in the proportion of 1 drop of the stain to 1 c.c. of distilled water and allowed to remain on the preparation from sixteen to twenty hours.

Personal Observations.

During the past four months the writer made studies comprising chancres, mucous patches, enlarged glands, condylomas, eruptions, and cerebrospinal fluid. The method of making preparations from the chancres and condylomata consisted in washing the surface with sterile salt solution and scraping the surface and deeper portions with a scalpel. Very little blood was seen in any film, the few cells observed being mostly lymphocytes. Sterile salt solution was mixed with the material from glands and the serum from the eruptions for study in the fresh condition. The material from the glands was obtained by means of a hypodermic syringe plunged into the organ and a few drops of fluid withdrawn. The serum

[1] Annales de l'Institut Pasteur, 1905, p. 761.
[2] Ann. de dermat. et de syphilis, June, 1905.

from the eruptions was secured by means of raising a blister, using either ammonia or chloroform upon absorbent cotton and covering with a small glass receptacle, making a dry cup, as done by Dr. Wilson. Or, in the later cases the skin was pinched up by means of a dressing forceps (as suggested by Dr. Coplin), held until blanching occurred, then a small incision was made and a drop or two of pure serum was collected in a capillary glass tube.

A small drop of the material from whatever source was placed upon a cover-glass, inverted upon a slide, the edges sealed with vaselin, and examined in the fresh condition. The sediment obtained by centrifugalization of the cerebrospinal fluid was examined the same way. In some specimens of fluid no sediment was obtained after several hours' centrifugalization.

Very good preparations were obtained with Wright's blood stain with dilute carbol-fuchsin, with Jenner's and with Romanowsky's blood stains. The best results were obtained with Giemsa's azur-eosin in the strength as first proposed by Schaudinn and Hoffmann. Fixation was accomplished with absolute alcohol or 95 per cent. alcohol for ten to twenty minutes, and thirty minutes to twenty-four hours' application of the stain was the usual routine. It was found, however, that just as good results were obtained in fifteen to thirty minutes as in twenty-four hours. The preparation must be thoroughly washed in water, as incomplete washing tends to throw down needle-like crystals. With carbol-gentian violet no satisfactory preparations were observed.

In the fresh state the spirochæta pallida was very difficult to see. The most common movement described by the parasite was bending of the whole organism backward and forward; or what may be described as quite a marked vibratory thrill. Occasionally a parasite could be seen attached to a red blood cell or a lymphocyte, and in one specimen an organism was present upon a long bacillary-like body. The pointed ends of the parasite were quite distinct, and the number of bends or curves varied from three to eight. In the stained spreads by Wright's method the spirochæta was colored a faint purple, while the spirochæta refringens was stained a deep purple. No matter what stain was used, nor how long applied the spirochæta pallida was exceedingly faint, and in some preparations the parasite could just be made out after a long and very careful search. In all preparations the organisms were extremely few, and no more than five were seen in any one field of the one-twelfth oil-immersion lens. On the other hand, the spirochæta refringens was comparatively abundant and could be made out without any difficulty. In the fresh as well as the stained preparations one could be easily misled many times by shreds of fibrin or mucus, taking on very fantastic shapes and outlines and resembling very closely the spirochætæ, both large and small.

In all 34 cases of syphilis were examined. There were 10 chancres, 11 mucous patches (10 from the mouth and 1 from the rectum),

4 enlarged glands, 3 condylomas, and 6 eruptions. As the disease is regarded as a spirillosis by some observers, the cerebrospinal fluid from 14 cases was examined. In most of these specimens no sediment could be obtained for study. The greater number were obtained from cases of cerebrospinal syphilis, while the remainder were from patients in the eruptive stage of the disease. In every specimen of material examined, with the exception of the cerebrospinal fluid, the spirochæta pallida was demonstrable. Attempts to cultivate the spirochæta pallida upon fluid human-blood serum in the aërobic and anaërobic conditions were entirely without results. The serum was incubated for three weeks at 37° C. The method of procedure was to draw blister serum in a capillary tube from a known healthy person, add a drop or two of serum from a blister over the eruption of a syphilitic, seal the tube in the flame or plug with cotton, and incubate.

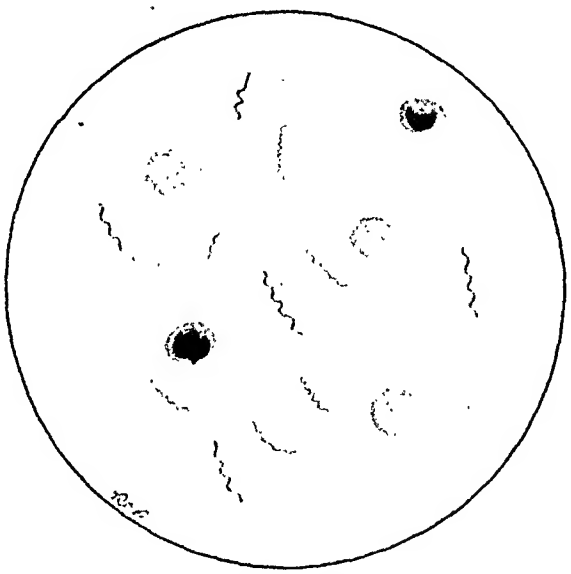
As control cases, preparations were made from diseases which were not specific in nature and included chancroids, eczema, psoriasis, balanitis, enlarged glands other than syphilitic, bone-marrow, spleen, and liver of a child supposed to have died from congenital syphilis, serum from blisters in healthy subjects, material from a case of scarlet fever, two non-specific ulcers of the penis, and an ulcer of the tongue. In none of these conditions was any spiral organism observed. In two ulcers of congenital syphilitic origin—one in a child aged two years, the other in a girl aged sixteen years,—no spiral organisms were seen. In the blood from several cases obtained from the finger and also from the vein of the arm the examinations gave negative results as to the presence of the spirochæta pallida.

In the examination of a mucous patch from the mouth so many spiral organisms were encountered of various sizes that a number of controls from healthy mouths were studied. To this end scrapings from the buccal mucous membrane and from the margin of the gums and teeth were collected from 47 persons in good health. In 36 at least two forms of spiral organisms were encountered, while in 28 three forms were plainly seen. One form almost constantly present was similar to the spirochæta refringens; a second variety was short, stained rather faintly, had from two to four curves, pointed ends, and was slightly thicker than the spirochæta pallida. The third form was a very long, thin, faintly staining spiral, sometimes with a loop formed in its length, and pointed ends. Another form constituting a fourth variety could not be differentiated from the spirilla observed in Vincent's angina; however, this spirillum was present in only a few cases.

In another series of controls the mucous membrane scrapings were obtained from twenty inmates of the women's venereal ward, suffering from diseases other than syphilis. In all these specimens an organism was found corresponding to the spirochæta refringens,

while in 80 per cent. a palely staining spiral was present which could be differentiated from the pallida in being slightly thicker and not possessing such decidedly pointed ends. The spirochæta refringens, however, resembled the one found associated in syphilitic lesions. In one chancre spirals were encountered which stained faintly but were too long for the spirochæta pallida, being at least 30 to 40μ in length, $\frac{5}{10}\mu$ in thickness, and possessing pointed ends.

The organisms are more abundant in the early days of the appearance of any lesion. Upon several occasions, where four or five organisms were found in a field, a second preparation made later from the same situation, though the patient received no local treatment, yielded only one or two parasites to a cover-glass, and in some cases none could be found.



Spirochætæ found in syphilis. The darker staining parasites are the spirochætæ refringens; the palely staining organisms, the spirochætæ pallida. From a chancre.

It is the writer's opinion that the spirochæta pallida properly belongs with the animal parasites and is a protozoön; at no time was an undulating membrane demonstrated as in trypanosomes.

That it plays some part in the etiology of syphilis seems plausible, as it has not been encountered except by one or two observers in any other lesion than syphilis. The probable reason that the organism was not demonstrable before is on account of its extreme minuteness, the difficulty attending its coloration, and its scarcity in some of the lesions and preparations.

I wish to express my most sincere thanks to Dr. John D. Wilson for extremely valuable assistance in the collection of material and study of cases, and also to Drs. Dean, Dodge, and Smith, of the Philadelphia Hospital, for obtaining material upon different occasions.

REVIEWS.

A Manual of the Practice of Medicine Prepared Especially for Students. By A. A. Stevens, A.M., M.D., Professor of Pathology in the Woman's Medical College of Pennsylvania; Lecturer on Physical Diagnosis in the University of Pennsylvania; Physician to the Episcopal Hospital and to St. Agnes' Hospital; Fellow of the College of Physicians of Philadelphia, etc. Seventh edition, revised. Philadelphia and London: W. B. Saunders & Co., 1905.

The deserved popularity of this manual has induced the author to issue the seventh edition. The text has been carefully gone over and brought up to date, thereby making the book a valuable guide not only to students but to general practitioners and nurses as well.

Throughout the entire volume Dr. Stevens shows the result of his extensive experience as a teacher by the presentation of the subject matter in such a concise and comprehensive manner; also by the clever classification of the allied symptoms so as to leave the greatest impression upon the mind of the student.

In the early pages we find the contents systematically arranged, and following this the diseases of the various systems and organs are carefully considered. The book cannot be too highly recommended, and the author is to be congratulated on rendering such a distinct service to the student of medicine. R. B. S.

The Surgical Treatment of Facial Neuralgia. By J. Hutchinson, Jr., F.R.C.S., Surgeon to the London Hospital; Examiner in Surgery, Royal Army Medical Department. London: Kohn Bale, Sons & Danielsson, 1905.

This small volume contains a most interesting and instructive discussion of trifacial neuralgia. The subject is very thoroughly dealt with and the literature freely quoted. Throughout, however, are evident the author's views in favor of which he argues very strongly; in fact, at times he is hardly tolerant of the views of others. Generally speaking, his own views are radical. He does not think much of the less severe operations which deal with the peripheral

nerves, but argues in favor of attacking the ganglion itself in every case unless the pain is distinctly confined to a single nerve. Most surgeons, on the contrary, believe in employing the less dangerous operation of avulsion of the peripheral nerves before attacking the ganglion. The injection of osmic acid is put on a "level with nerve stretching," and we are told the author has no personal faith in it. The experience of Murphy, in Chicago, of other surgeons, and a limited experience of our own, goes to show that this treatment is not to be compared with that of nerve stretching, but that it ranks rather with nerve resection or avulsion in the degree of relief afforded.

The book is well written, and, although hardly fair to procedures recommended by certain men, nevertheless it is a book from which both physicians and surgeons can derive instruction.

An inaccuracy is noted in the author's criticism of the Abbe method of resecting the second and third divisions of the nerve within the cranium and interposing rubber tissue. Hutchinson speaks of placing a "disk of rubber" between the divided ends of the nerve; this is by no means the same thing as rubber or gutta-percha tissue which Abbe recommends.

The various types of neuralgia and the results of different treatments are well illustrated by the reports of cases. At the end of the book will be found a bibliography of the subject. J. H. G.

A Text-book on the Practice of Gynecology for Practitioners and Students. By William Easterly Ashton, M.D., LL.D., Professor of Gynecology in the Medico-Chirurgical College, and Gynecologist to the Medico-Chirurgical Hospital, Philadelphia. Philadelphia and London: W. B. Saunders & Co., 1905.

The time has long passed when a man simply because he holds the Chair of Gynecology in a teaching institution should feel called upon to add to the already long list of books upon this subject. Unless one is able by the inclusion of new material to advance the boundary lines of science or to present scientific facts in a new and better way there can be no good object obtained by the multiplication of works upon the diseases of women. We believe that all disinterested readers will agree with the truth of these postulates, and it gives us pleasure to refer such readers to this volume. It is, we believe, one of the best books upon the subject and we feel constrained to congratulate the author upon his efforts.

The volume is decidedly larger than most books of its type, which is explained partly on the ground of the inclusion of material that,

as a rule, finds no place in works of this kind, and also from the fact that the main indication given by the author for the preparation of the book was that he considered that there was a place for a volume "which aims to take nothing for granted in describing gynecological diseases, and which not only states what should be done in every case, but also gives directions and illustrations so explicit that they may be intelligently and easily followed." The aim which the author has consistently kept before him was to leave nothing to the "imagination or common sense" of the reader, and we feel sure that anyone reading the volume with care will agree that he has fulfilled his task most satisfactorily. In illustration of this it is but necessary to call attention to the directions for the preparation of the armamentarium for operations in private houses, a chapter which operators of experience will read with much pleasure. The inclusion of an illustration in the description of all operative procedures, showing the instruments which the author considers requisite for its performance, is but another evidence of the attention to detail which is manifest throughout the work.

As an aid to ready reference the whole subject matter is divided and subdivided by heavy faced type, thus enabling the contents of a paragraph to be taken in at a glance. This arrangement, together with the most excellent illustrations throughout the book, greatly enhance its value.

The first 150 pages may be considered to comprise the introduction, consisting as they do in the consideration of the "General Technique of Gynecological Examinations," "Microscopic and Bacteriological Examinations," "The Blood in Relation to Surgery," "The *x*-Rays in Gynecology," etc. A very strong point in this introductory portion of the work is the chapter upon the method of preserving specimens for laboratory investigation. The practitioner is given full instructions to enable him to place his specimens in the hands of the expert pathologist in good condition. No mention is made of the methods of examination, as the author rightly considers that these are better considered in special works upon the subject.

The chapters devoted to "Asepsis in Hospitals" and the "Technique of the Various Operative Procedures" are most thorough and exemplify the attention to the minutiæ of detail which is manifest throughout the whole volume. A peculiarity in his operative technique is the small number of assistants which he uses. Thus in an abdominal section but one, his opposite at the operating table, is supposed to be surgically clean, the operator tending to his instruments and suture material himself. This we believe to be a mistake, as there can be no doubt that more time is consumed than is necessary in the performance of the operation. We do not believe that there is an increased danger of infection in a well-appointed clinic from the admission of another assistant,

while on the other hand there can be no question that the element of time is not considered as it should be in these days of surgical anæsthesia. We are, however, thoroughly in accord with the author in placing the responsibility for septic infection squarely upon the shoulders of the operator and no one else; we do believe, however, and we speak from experience, that it is perfectly feasible to train an intelligent woman so that she will be in all respects the equal of the operator in conscientious regard for the principles of asepsis.

We notice that the credit for the operation of ventrosuspension is ascribed to Kelly, which is a mistake, and that the author only employs this operation or an intraperitoneal shortening of the round ligaments in the operative treatment of retrodisplacements, making no mention of Alexander-Adams' inguinal canal operation. In considering the method of dilating the cervix a branched instrument is advised, operated by a crank. This we believe to be a mistake, as all such devices of necessity destroys the delicacy of feeling gained by the manual control of the instrument, and thus tend to cause lacerations of the cervical canal.

We do not think that the majority of operators will approve of the relative importance placed upon ventrofixation in the treatment of prolapse of the uterus, together with the seeming disregard of the important province of plastic work in the correction of this condition.

In common with all experienced men the author lays stress upon the importance of the early diagnosis of uterine carcinoma, and as an aid to the detection of cases while in the operative stage he advises that all parous women who have reached the age of forty years should be examined and if any lacerations of the cervix be found that they should be repaired.

The one and only statement in the whole book which in our opinion merits really unfavorable criticism is that gonorrhœa of the endometrium is an indication for a curettement without regard to the stage of the disease. We fail to see the reason for this statement and look upon it as a distinctly retrograde step in teaching, and one which will if followed be the cause of unnecessary adnexal complications.

His chapter upon "Sterility" is of special interest, while the radical suggestion that it is a legitimate procedure to open the abdomen, in order to explore the conditions of the Fallopian tubes, upon the ground that lesions resident in them are the most frequent causes of infecundity, will at least give good grounds for academic discussion.

While admitting that there may be reason upon the side of the author in not considering the operative procedures for the relief of postoperative hernia and fecal fistula, we still feel that they should have been included in the book for the sake of completeness. We congratulate the author upon the very full and able exposition of the various methods of intestinal anastomosis, and indeed upon the

whole chapter of over 100 pages which he has devoted to operative technique. The chapter upon operative asepsis in private houses will be of great value to those especially upon whom such work only occasionally devolves. It is a little unfortunate, in our opinion, that in the discussion upon the asepsis of the operator that there is no mention of the value of the face mask. The special operative procedures are considered in a chapter by themselves, while appendicitis and movable kidney are very thoroughly treated in the last two chapters of the book. W. R. N.

A Text-book of Clinical Diagnosis by Laboratory Methods. By L. Napoleon Boston, A.M., M.D., Associate in Medicine and Director of the Clinical Laboratories Medico-Chirurgical College, Philadelphia; formerly Bacteriologist at the Philadelphia Hospital and at the Ayer Clinical Laboratory of the Pennsylvania Hospital. Second edition. W. B. Saunders & Co., 1905.

The fact that a second edition of this book has been demanded within a year of its first publication is the most striking proof of its usefulness and popularity.

The author modestly claims that his work is but "a working introduction into the department of medicine under discussion." We are inclined to go much farther and state that it is a very thorough treatise on the subject, abbreviated sufficiently, however, as not to be unwieldy while preserving throughout its intention of being practical. To again quote the author, "the methods described are such as can be carried out with a minimum of complicated apparatus." In the new edition a number of valuable tests recently brought into prominence are added, and the subject of cytodiagnosis is more thoroughly enlarged upon as having proved its value.

Among the more important addenda are: Ficker's agglutination reaction with dead typhoid bacilli; Camerer's test for purin bodies in the urine; Cammidge's test for glycerin in the urine in diseases of the pancreas; a quite simple new test for indican in the urine; Cippolino's test for determining the acidity of the gastric contents.

Of the more recent discoveries in clinical diagnosis we must note the absence of any mention of the spirochæta pallida observed by Schaudinn and others in the lesions of syphilis.

The book is beautifully printed on fine paper, and the plates are among the best that the reviewer has ever seen in a work of this kind. F. F.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Cholecystitis Typhosa.—DOERR (*Wien. klin. Wchnschr.*, 1905, Bd. xviii. p. 884) and FORSTER (*Münch. med. Wchnschr.*, 1905, Bd. lii. p. 1473). The occurrence of typhoid bacilli in the bile of typhoid patients and typhoid bacilli harborers.

Doerr adds another interesting case of cholelithiasis and cholecystitis caused by the typhoid bacillus. That this organism is frequently found in the bile passages during and long after an attack of typhoid fever has now been established by numerous investigations, indeed the work of Blachstein and Welch would indicate that at least in certain periods of the disease they are constantly present. The bile has no deleterious action upon their growth even after the patient has recovered from the disease and is immune to further infection. The organisms, as a rule, produce in the gall-bladder no pathological condition, but at times inflammations occur varying from slight catarrhal, which rapidly subside, to severe purulent, which not uncommonly go on to necrosis. Such cases have repeatedly yielded at operation pure cultures of typhoid bacilli. The organisms may, however, remain in the gall-bladder for many months and even for many years without producing any symptoms, and then, under certain conditions, set up an acute inflammation. Such attacks are almost always associated with gallstones. An examination of gallstones has shown how frequently masses of typhoid bacilli form the nucleus about which the stone is deposited. The typhoid bacillus has been recovered from the gall-bladder twenty years after the attack of typhoid fever. Dunham has suggested a relation between gall-bladder infection and relapses, and Doerr points out the importance from an epidemiological point of view of an almost continuous reinfec-

tion of the intestinal canal with the frequent discharge in the feces of virulent typhoid bacilli in individuals who might never be suspected of harboring the organisms.

Doerr's case is interesting in that the preceding attack of typhoid fever was so mild that the history of it was elicited only after operation gave the suggestion. The patient's blood, however, possessed the characteristic agglutinative properties conferred by an attack of typhoid fever, properties which a gall-bladder infection alone can, he believes, neither convey nor prolong. The organisms obtained in pure culture from the pus and from the gallstone were identified by all the modern methods of cultural and serum diagnosis as true typhoid bacilli. Experiments made by Doerr to throw light upon this question showed that organisms injected into the blood of rabbits appeared after a few hours in the gall-bladder, while typhoid bacilli and those of the colon group multiplied and might be recovered in pure culture after four months. Organisms ingested or introduced by subcutaneous or intraperitoneal injections do not result in infection of the gall-bladder. The bacilli introduced intravenously after appearing in the gall-bladder cause a purulent inflammation, which rapidly subsides. The growth of the organisms in the bile has no influence in prolonging the agglutinative properties acquired by the blood from the original intravenous injection. Typhoid bacilli are from time to time ejected into the intestines and appear in the stools. Antiseptics medicinally administered or injected intravenously do not free the bile from the infection.

Forster has examined at autopsy the bile bacteriologically in 140 cases, in only 8 of which was typhoid fever the cause of death. Of the non-typhoid cases 2 had gallstones. Typhoid bacillus was cultivated from the bile of one and paratyphoid from the other. Of the 8 typhoid cases, in one instance where the autopsy was performed after the body had been lying a long time colon bacillus alone was cultivated from the bile and spleen. In the other 7 the bile of all contained a pure culture of typhoid bacillus and the organism was further recovered from the jejunum six times, from the ileum five times, and from the colon twice. This gradual decrease from above downward in the frequency with which they were obtained from the intestines suggests the possibility that the bile may be the source of the intestinal infection. In animals inoculated with typhoid bacilli the organisms were recovered from the bile and intestines many weeks after the injection and long after they had disappeared from the blood and urine. Similar observations are made clinically. Forster refers to a woman with gallstones and typhoid bacilli in the stools who had had typhoid fever thirty years before. He points out, too, that most individuals identified as harborers of typhoid bacilli are women, and comments on the fact that it is notorious how much more commonly gallstones occur in women than in men.

Blumenthals reports a case where the same paratyphoid organisms were found in the stools as in the bile and gallstones; after operation they disappeared from the feces and had not recurred after a year. In the neighborhood of typhoid fever cases there are always individuals who remain perfectly healthy and yet show for at least short periods bacilli in the stools. One may suppose that bacilli which gain entrance to the intestinal tract multiply there and are then passed with the movements, but it is possible that at least some of these cases have a mild ambulatory form of the disease with an infection of the bile.

Bacteriæmia in Pulmonary Tuberculosis.—JOCHMAN (*Deutsch. Arch. f. klin. Med.*, 1905, Bd. lxxxiii., p. 558. For many years it has been a very popular view to consider the fever and constitutional symptoms in the late stages of pulmonary tuberculosis to be due to the activity of organisms other than the tubercle bacillus, to the flooding of the blood with secondary invaders. Advocates of this view have pointed for support to the frequency with which pyogenic organisms have been found in the blood of phthisical patients. Streptococcus being the most common, they have even described a characteristic streptococcus fever curve. The results of blood examinations, however, have varied considerably with different investigators and the technical methods that have been employed by some are not beyond criticism. Early workers used a drop of blood obtained from the finger-tip by puncture, a procedure which must in all but extremely rare cases be insufficient to demonstrate organisms even when present and one to which is evidently attached great risk of contamination.

Jakowski, in 1893, obtained by this method 7 positive results in 9 cases, cultivating twice streptococcus, four times staphylococcus, and once streptococcus and staphylococcus. Hewelke, in 1896, obtained 14 positive cultures in 21 cases, staphylococcus in 7 instances, once diplococcus, and in the other cases non-pathogenic organisms. Petruschky with a similar method found streptococcus once in 8 cases. With the improved Sittmann method in which 1 or 2 cm. of blood was drawn from a vein, a method affording a larger quantity of blood and lessening greatly the danger of contamination, the originator obtained in 4 cases staphylococcus aureus twice, and once staphylococcus albus. Kraus in 14 cases staphylococcus once. Hirschlaff in 35 cases found staphylococcus albus in 4; Michaelis and Meyer in 10 cases had 8 positive results, obtaining staphylococcus 5 times, twice staphylococcus and a diplobacillus; once staphylococcus and streptococcus. Fraenkel in 20 cases had only negative results. Schroeder and Naegelsbach negative results in 8 cases, Strauss in 19 cases, and Lemierre in 8 cases. Lasker in 68 cases had only a single positive culture, in which instance streptococcus grew out in great numbers. At the present time men who are working with blood cultures look askance at reports showing the frequent presence of staphylococcus, and staphylococcus albus, particularly, is a common contaminator and has only a very restricted pathogenicity. In striking contrast to the above reports of the frequent finding of staphylococcus in the living patient are the autopsy results which rarely or never yield staphylococcus but frequently streptococcus. Schabad in 15 cases found streptococcus 8 times; Petruschky in 14 cases 8 times. Simmons reports having found bacteria in the blood of phthisical corpses 37 times in 108 examinations; the streptococcus 28 times, pneumococcus 4 times, and colon bacillus 5 times.

Jochman has made his examinations with the newer methods, using a large quantity of blood obtained by aspirating the vein under the most careful aseptic precautions. All of the patients examined were in an advanced stage of phthisis, some even moribund. Many had the intermittent temperature curve which has been considered by some typical of streptococcus invasion. All 40 of his examinations proved negative. Nine of these 40 cases came later to autopsy, and of these 9 in only 2 could organisms be cultivated from the blood—once streptococcus in pure culture and once streptococcus and staphylococcus aureus. The

absence of streptococcus from the blood during life and its not infrequent discovery after death may be explained either as a preagonal invasion or as evidence of a very rapid reproduction by a few scattered organisms that may have been in the blood before death.

The postmortem invasion of the blood Jochman considers improbable. He is inclined to believe that a true bacteriæmia occurs only very rarely in pulmonary tuberculosis, even in late stages. To what extent the absorption of toxins from streptococcus and staphylococcus active in the old lung lesions may influence the temperature and general symptoms of the patient is another question.

SURGERY.

UNDER THE CHARGE OF

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Three New Cases of Interscapulothoracic Amputation, with Considerations on the Results of and Indications for the Operation and a Modification of Operative Technique.—BERGER (*Revue de chirurgie*, August, 1905) gives in detail in this article his last three cases of interscapulothoracic amputation, the first case being one of sarcoma of the upper extremity of the left humerus, the second a recurring chondroma of the upper portion of the left humerus involving the scapula, and the third a sarcoma of the armpit in which extirpation of the growth was first tried, but owing to a rupture of the axillary artery an interscapulothoracic amputation was immediately done. In discussing the mortality of the operation he divides the cases into three groups according to the situation and character of the growth:

1. In malignant growths confined to the humerus, the mortality, in the cases he has collected, is 3.12 per cent. In chondromas of this region so far no deaths have been reported, so that the total mortality from tumors involving the humerus is 2.75 per cent.

2. In malignant growths involving the scapula the death rate is 25 per cent.; for chondroma of this bone but one operation with recovery has been reported. The total mortality for scapular tumors is 23.80 per cent.

3. Various malignant growths of the soft tissues of the shoulder region, with uncertain boundaries, mortality 11.24 per cent.

He then speaks of the safety of this operation for tumors confined to the humeral region, and the dangers of waiting until such growths

become large and break through their capsule, invading the soft tissues of the scapular region. He calls attention to some brilliant end results following this operation where patients are still living and well from six to fifteen years after operation, and also to the fact that the ultimate result is far better where growths are confined to the humeral region. In discussing the technique of the operation he again asserts that the key to success is the control of hemorrhage. Previously his technique had been to resect the middle portion of the clavicle and at once expose and ligate the subclavian or axillary vessels. In these last three cases he has modified this procedure by dividing the clavicle a little to the outer side of its middle, denuding the inner portion of its periosteum, and then, by twisting, fracturing the bone just outside of its sternal articulation. The outer fragment of the clavicle is then resected up to the deltoid tubercle.

In the first case reported in this article, after a resection of the middle third of the clavicle, Berger found he could not expose the subclavian vein on account of its depth in the wound, the hemorrhage from the surrounding veins, and its partial covering by the inner portion of the clavicle. He therefore found it necessary to resect the inner third of the clavicle. After its removal "it was only play to denude the vein, then the subclavian artery, and to divide them between two ligatures." This was the first case in which he had to resort to practically a complete excision of the clavicle in order to facilitate ligation of the axillary vessels, and the extreme ease with which it was accomplished, together with the much freer exposure of the vessels, has made it "a valuable addition and simplification of his previous operative technique." His former technique for exposure of the vessels consisted of a resection of the middle third of the clavicle. He criticises this as being rather difficult, saying that the passage of an instrument beneath the clavicle with an oblique sawing of the bone is hard to accomplish on account of the proximity of the first rib to this portion of the clavicle, and for this reason almost always the clavicle is divided too far to the outer side, so that the inner portion of the bone remains as an obstacle. In all of his previous operations (three in number) this has rendered the denudation of the axillary vein extremely laborious. This jutting out of the bone often delays healing in the overlying wound, and even after healing it lifts up the skin in an unsightly manner and causes annoyance to the patient from rubbing of the clothing.

In speaking of the advantages of the removal of the inner third of the clavicle, he says that the space gained is considerable, permitting a plain view of the axillary vein, of its easy isolation from its sheath, and of the possibility of passing ligatures beneath it in plain sight. Of its disadvantages from an operative standpoint he says there are none if the extirpation is practised after the clavicle has been divided. "I advise, therefore," he says, "in the first part of an interscapulo-thoracic amputation substitution for a resection of the middle portion of the clavicle, the resection of its sternal extremity, practised after the bone has been divided at its middle."

The article, which is 42 pages long, terminates with his personal statistics in this amputation. These consist of 6 cases, 1 of which died from the operation, 1 within a few weeks from chest complications, 2 others have been so recently operated upon that the results are unde-

termined; a fifth, for chondroma, was living and well at the end of fifteen years, and a sixth, a myxoma of the humerus, was well after nine years.

[It seems strange that Berger should have made no reference to the method published by Le Conte, of Philadelphia, in the *Annals of Surgery* in September, 1899, nor to the paper the same surgeon read at the International Congress in Paris in 1900, when in this latest article he mentions a score of men who have reported cases.

The practical difference between his technique and the one Le Conte suggested is that he divides the clavicle at its middle, denuding it of its periosteum, and then resects the inner portion from without toward the median line; while Le Conte proposed that the bone be disarticulated at the sternum and entirely removed, believing that to be as simple and easy as any other method, and at the same time when the outer end of the clavicle is involved in a malignant growth to have the advantage of taking away the whole bone with its periosteum. The exposure he obtains for ligation of the vessels is almost the same as the one Le Conte suggested, but does not afford quite so big a field, for he does not separate the clavicular fibres of the pectoralis major from the pectoral fibres nor does he divide the pectoralis minor muscle before exposing the vessels. Such muscular division very much broadens the view into the axilla. It is interesting that after more than twenty years' work on this amputation he should come to practically the same conclusion that Le Conte did a few years ago, and as he has overlooked or forgotten to give due credit to Philadelphia surgery for an original and valuable suggestion, it seems worth while to call attention to his failure to do so.—J. W. W.]

A Case of Suture of the Spinal Cord following a Gunshot Injury Involving Complete Severance of the Structure.—FOWLER (*Annals of Surgery*, October, 1905) says that the main points of interest in his case relate to the possibility of regeneration of the spinal cord following a destructive lesion. Twenty-six months after the injury voluntary motion is practically lost in the affected area. He can stand with the support of the hands, and can make some locomotion by swinging movements in a special frame on wheels. He has the sensation that the bladder and rectum are about to empty themselves, and if the urinal and bed-pan are brought to him promptly, soiling is prevented. The urine passed in this way averages more than a pint in twenty-four hours. Some urine is voided during sleep. Sensation is practically abolished in the affected part, except for a small area, five inches long, on the outer side of the right thigh. He is not able to correctly distinguish between heat and cold. Tactile sensations are recognized, but are usually referred to a point two or three inches distant from the point touched. Marked rigidity and spasticity of both legs are present. Patellar reflex exaggerated; Achilles reflex marked. Ankle clonus present on one side and absent on the other. The reaction of degeneration is absent.

The fact that upward of ten days elapsed before consent to operation was obtained is an important consideration in this case. This delay, with the separation of the divided ends of the cord by the bullet, probably tended to prevent a complete regeneration of the cord.

THERAPEUTICS.

UNDER THE CHARGE OF

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Local Anæsthesia.—DR. E. IMPENS believes the disadvantages of stovaine to be its acid reaction, its lack of easy solubility in water, its precipitation in freely alkaline solutions, and its tendency to cause ocular disturbance. Consequently he has sought, in connection with DR. F. HOFFMANN, an anæsthetic which shall prove more satisfactory, and has found it in alypine, benzoyltetramethyldiaminoethyldimethylcarbonol hydrochlorate. This substance occurs in non-hygroscopic crystals, melting at 169° C., very soluble in water, of neutral reaction, and not precipitable in freely alkaline solutions. In solution it may be sterilized by boiling for ten minutes or more. Injections of 5 per cent. solution cause no local reaction; its anæsthetic effect is more marked than that of cocaine; 2 per cent. solution when instilled into the cornea causes a fleeting burning sensation, and then an anæsthesia of eight to ten minutes' duration, without effect upon accommodation. It is a vasodilator and has no toxic effect.—*Deutsche medizinische Wochenschrift*, 1905, No. 29, p. 1154.

Beta-eucaine in Local Anæsthesia.—PROF. H. BRAUN considers the anæsthetic effect of beta-eucaine given hypodermically to be entirely similar to that of cocaine. Even 10 per cent. solution causes no pain or irritation, and a distinctly anæsthetic action is noted from 0.5 per cent. solution. The anæsthesia from eucaine is slightly less persistent than that from cocaine; 1.5 per cent. solution of the former being about equivalent to 1 per cent. solution of the latter. Strengths greater than 1 per cent. anæsthetize beyond the infiltrated zone, but to a less degree than is the case with cocaine. The tissues are not injured by an osmotically indifferent and moderately concentrated eucaine solution, the wheals disappearing rapidly. Solutions of less than 5 per cent. strength require the addition of from 0.6 to 0.9 per cent. sodium chloride solution to prevent swelling. The diminished toxicity of eucaine over cocaine is remarkable, authorities agreeing that its fatal dose is from three to three and a half times greater than that of the latter drug, and it is probable that the same quantity is less toxic when injected in weak than in strong solution. No stronger solution than 2 per cent. need ever be employed, and as regards dosage, $2\frac{1}{4}$ grains in 0.5 per cent. solution or $4\frac{1}{2}$ grains in 0.1 per cent. solution may be given. The author finds that the pain, the marked hyperæmia, and damage to tissues resulting from the use of stovaine are wholly wanting after the use of eucaine.

Beta-eucaine lactate has the same effect as the hydrochlorate and is quite as free from unpleasant qualities.—*Local Anæsthesia* (J. A. Barth, Leipsig, 1905).

Beta-eucaine in Nose and Throat Anæsthesia.—Dr. Thomas J. Harris has tested this drug in solutions of different strength in various operations on the nose and throat, and considers that it may, unlike cocaine, be used in the strongest solutions without fear of toxic symptoms. It does not lose its anæsthetic power under the usual periods of office use. Its anæsthetic effect seems to be somewhat less than that of cocaine, and in the more painful operations should be used in correspondingly stronger solutions. In the discussion following this report Wilson stated that in certain operations cocaine possessed marked advantages, but that eucaine is especially effective in the larynx. When used in introducing a cannula into the trachea it produces none of the unpleasant choking following the employment of cocaine. When used in the eye it does not dilate the pupil, but markedly anæsthetizes the cornea.—*The Laryngoscope,* 1905, No. 6, pp. 484 and 512.

The Treatment of Pneumonia.—Dr. Gustav Schirmer treats pneumonia as follows: The room is kept well aired and at even temperature. The diet is light and the patient is not allowed to move himself; when change of position is desirable, this is accomplished by the attendant. The heart is examined daily; the chest very seldom. The bowels are kept open and the mouth and throat disinfected. Simple expectorants and urotropine are given, but no heart tonics, antipyretics, or narcotics are administered. The sick-room is vaporized with thymic acid, 1 part; oil of gaultheria, 60 parts; oil of eucalyptus, 60 parts; camphor, 1 part, and rectal irrigations of 1 pint of normal saline solution are given every two hours as long as the temperature and the toxic symptoms continue. On the first day 1 ounce of unguentum Credé is rubbed into the skin, on the second ½ ounce, and a less quantity on the following days. Severer cases receive a total of 5 ounces. When this treatment was instituted on the first day all patients recovered, and the author attributes his good results to the inhalations and the inunctions. When begun later in the disease the treatment is less successful. Iron is prescribed early in convalescence and the patients are kept in bed for ten days after the crisis.—*New Yorker medizinische Monatsschrift,* 1905, No. 7, p. 283.

Antitussin in Whooping-cough.—Dr. Richard Rahner states that this substance is composed of 5 parts of difluordiphenol, 10 parts of vaselin, and 85 parts of lanolin. It is administered by inunction over the neck, the chest, and the interscapular region, the parts being previously thoroughly washed with soap and water. Of 200 patients treated the author reports success in all but 20. In most of them the paroxysms were reduced 50 to 70 per cent. by the fifth day. They continued their diminution in number and intensity for two weeks more, and by the end of the third week had entirely disappeared. The dyspnœa and cyanosis usually are gone after the second inunction. The treatment also prevents the complications; it not only acts upon the spasmodic manifestations of the disease, but facilitates expectoration. It produces no bad effects and may be applied to infants, but is ineffectual in cases complicated by bronchopneumonia or rickets. In

regard to other modes of treatment the author considers that inhalations of carbolic acid are beneficial, bromoform is too inconvenient, antipyrine and phenacetine are ineffectual. In one case phenocol hydrochlorate was successful, but in all the others merely lessened the number of paroxysms without shortening the course of the disease. Pertussin had no effect. Quinine with sodium bicarbonate lessened the paroxysms and shortened the disease, but is not so effectual as antitussin. —*Münchener medizinische Wochenschrift*, 1905, No. 25, p. 1199.

The X-ray in Lymphoid Conditions and Leukæmia.—Dr. A. Becbere states that in these conditions the *x*-ray causes a diminution in the white cells, and at the same time an increase of the red cells and of their hæmoglobin content; the enlarged spleen diminishes in size to more or less normal dimensions. The glandular swellings diminish in size, the decrease in those within the thorax being evidenced by relief of the symptoms due to pressure. In 2 patients the treatment caused a disappearance of albuminuria. With the amelioration of the pathological condition of the blood the general condition was improved, the fever, the pain, the insomnia, and the fatigue disappeared; the appetite and body weight were increased. In pseudoleukæmia and leukæmic states evidenced by changes in the white cells rather than by increase in their number, analogous results were obtained. The author concludes that in all varieties of lymphadenia and of leukæmia radiotherapy is the treatment of choice.—*Archives d'électricité médicale*, 1905, No. 169, p. 495.

The Treatment of Arteriosclerosis.—Dr. Manfred Fraenkel considers that iodine is not indicated in this condition, since its only effect is to lessen the tension on the vascular walls. A rational treatment must be one which acts favorably on the metabolism of the vessel walls, strengthens the vasomotor system, and lessens the blood pressure. Trunecek's serum has given excellent results, which are due to the action of the salts contained in it; the dyspnœa becomes less owing to the increased alkalinity of the blood, and the sodium salts act directly upon the heart and the vascular epithelium. The use of this serum, however, is painful and the daily injections are wearing both upon physician and patient; as a prophylactic it has the disadvantage that the patient objects to a painful and tedious treatment for an incipient disease. It has been found that the serum acts as well when given by mouth as when administered subcutaneously, consequently the author advises the use of antisclerosin, which consists of the salts contained in the serum. The first group of 25 patients treated by the author with this compound included advanced cases. In many the vessels were distinctly hardened and elongated. The observations extended over about one year. In 19 cases the subjective and objective symptoms were relieved for different periods or disappeared for months; in the 6 others the symptoms were relieved slowly, disappeared for a short time only, and recurred when the drug was stopped. The author concludes that the chief field for antisclerosin is prophylaxis at the earliest appearance of the symptoms which indicate arteriosclerosis. Among these may be included a peculiar indefinable sensation in the præcordium, slight dyspnœa, especially on walking, dizziness, temporal throbbing, going to sleep of the extremities, tinnitus, visual dis-

turbances without ocular lesion, and indigestion. The patient's age, somewhat tense and hard pulse, plethora, gout, or rheumatism substantiate the diagnosis. Such symptoms may be removed by the use of antisclerosin. The drug should be given until the symptoms disappear, and intermitted for two or three weeks before resuming. If the symptoms recur a renewal of the treatment is indicated. No unpleasant effects have been observed from the administration of this substance.—*Wiener klinische Rundschau*, 1905, Nos. 29 and 30, pp. 509 and 527.

Cannabis Indica in Migraine.—Dr. G. Caron de la Carriere has employed the following treatment with good results: He prescribes the drug in pills of the extract containing ¼ grain each, beginning with one pill at bed-time for thirty days. If beneficial this dosage is continued, but if not two pills are given in the evening and one in the morning. The treatment should be continued for a year. After this period he prescribes the treatment for one month at a time at intervals of varying duration. In the above doses no signs of intolerance or of becoming accustomed to the drug were noted. As an adjuvant the author advises daily hot douches at 100.4° to 104° for one to two minutes, later raised to 109.4° to 113°. The jet is applied only to the head and the nape of the neck. Cold douching of the feet may also be employed. In acute attacks the hot douche acts as a sedative when given in connection with rest in bed and application to the forehead of menthol, chloroform, and methyl salicylate, each 5 parts; in lanolin, 30 parts. This may be used alternately with applications of very hot dry compresses to the head. The patient may be benefited by a sojourn at one of the various health resorts.—*La presse médicale*, 1905, No. 57, p. 449.

Neuronal as a Hypnotic and Sedative in Insanity.—Dr. M. Artarit concludes a study of neuronal, based upon a series of 53 observations, as follows: In doses of from 15 to 30 grains neuronal possesses a true hypnotic action, especially marked in simple insomnia, the insomnia of maniacal states and of psychosensory conditions. Its action is also evident in insomnia due to pain. It is not cumulative and may be given for days or weeks without harm; it does not lose its effect, and when stopped does not cause trouble; its effect lasts several days. Its bad taste is pronounced, but may be disguised by syrup of lemon or of bitter orange-peel. It cannot be considered effectual in the convulsive crises of epilepsy, contrary to the hopes of German observers. The author's experience proves that it has no effect upon circulation or respiration. In toxic dose it seems to tend to cause paresis of striated and smooth muscle fibre. The bromine which it contains is rapidly eliminated by the kidneys and causes no cutaneous eruption. Its presence in the blood current causes no modification of the blood cells, nor any change in their shape.—*Revue de thérapeutique*, 1905, No. 17, p. 577.

Urotropine in Typhoid Bacilluria.—Dr. Charles D. Easton reports the result of a test of this drug made at the Massachusetts General Hospital. Every typhoid patient during the past year was given 5 grains of the drug throughout the disease. It was stopped as soon

as convalescence became established, and six to ten days afterward in 46 of the cases repeated urinary examinations were made. In no case was there any growth of typhoid bacilli and all the specimens appeared perfectly clear. In 1 case of particular interest, when the temperature became normal, the urotropine was stopped and no bacilli were found in the urine. A few days later a relapse occurred, complicated with cystitis. The culture from the urine showed the bacilli in large number. Urotropine was resumed, and when discharged the patient's urine was free from bacilli. About a week later he suffered from a swollen testis and slight cystitis, which disappeared five days after urotropine was readministered, showing that the complications—orchitis, epididymitis, and prostatitis—are ascending infections from urine containing typhoid bacilli. Altogether 486 patients were treated with urotropine. Nearly all received from 8 to 10 grains and some 15 grains three times a day. There were 3 cases of painful micturition and 2 of hæmaturia. In several a few red blood cells were found. All cleared up in a few days after the drug was stopped. The author concludes that the moderate use of urotropine through the disease prevents cystitis and other genitourinary complications, and renders the urine innocuous, making the early discharge of typhoid convalescents harmless to the community.—*Boston Medical and Surgical Journal*, 1905, No. 7, p. 195.

The Treatment of Acute Suppuration by Passive Hyperæmia.—Dr. Derlin has treated by Bier's method 2 cases of severe phlegmon and 1 of osteomyelitis with entire preservation of function, and considers the result attained to be due to this form of treatment. The limb below the lesion was bandaged with a band of rubber and gauze until a red œdema was produced. This œdema, which reached to the bandage but not below it, was noted only during the early days of the inflammation. Blueness of the extremities was induced very slowly. The more severe the inflammation the more intensely red was the congested area. The incisions made were not packed, but were only lightly wrapped with gauze, particularly in the case of the phlegmons. The influence of the hyperæmia upon the temperature in the case of osteomyelitis was remarkable, the fever disappearing in about eight days, and the pain was relieved as the œdema appeared. The treatment is easy of employment, is not painful, produces good results, and is of short duration.—*Münchener medizinische Wochenschrift*, 1905, No. 29, p. 1399.

The Treatment of Chronic Perityphlitis.—Dr. A. Albu lays down the following treatment for cases in which operation is not indicated: The patient should refrain as long as possible from muscular exertion. When walking he should rest frequently and avoid quick movement. In cases with marked symptoms the patient should remain in bed for some weeks. Lighter cases should lie down for several hours twice a day, while hot moist applications are made to the abdomen. The bowels should be regulated by a diet, chiefly vegetable, and by irrigations of oil, glycerin, or soap-suds when necessary. Suppositories containing 0.15 to 0.45 grain of belladonna extract, given once or twice daily, are useful, and tepid or hot sitz baths may be taken once a day. Salt or mud baths three or four times a week may produce good results, or a sojourn at a spa, under the surveillance of a physician, who shall

regulate the diet and mode of life, may prove beneficial. Care and proper management may effect a permanent cure or at least ameliorate the symptoms.—*Deutsche medizinische Wochenschrift*, 1905, No. 25, p. 993.

Exodin, a Synthetic Purgative.—Dr. Otto Schmechel has given exodin to 100 patients, chiefly healthy puerperæ, after normal delivery, who had had no evacuation for three days after the termination of labor. The dose was 30 grains in most cases, and it effected a stool in from eighteen to twenty-four hours. The movements were sometimes formed, but usually soft and brownish; they contained no mucus, and in only one case was there tenesmus or tendency to diarrhœa. Often there was a second stool on the same or the following day. The infants were observed to ascertain if any purgative effect occurred from possible transmission through the milk. None was noticed. The urine was unaffected, the drug was taken without disgust and caused no nausea. —*Inaugural Dissertation*, Munich, 1905.

A Solution of Quinine in Serum for Hypodermic Administration.—Dr. M. Malafosse, believing that the unpleasant sequelæ of the ordinary solutions of quinine when given under the skin are due to the causticity of the solutions, has employed in numerous cases a 0.2 per cent. solution of quinine bichlorate in artificial serum. This he has used with excellent results in severe cases of malarial poisoning. The weakness of the solution necessitates the injection of large quantities, but the only precaution to be taken is not to inject more than 2½ drachms into one spot. An ordinary hypodermic syringe may be used, and the author has employed the treatment over 3000 times without accident. A further point in its favor is that the serum adds to the antimalarial action of the quinine a tonic and diuretic effect.—*La semaine médicale*, 1905, No. 18, p. 208.

The Treatment of Syphilis.—Dr. A. Lieven considers potassium iodide, in spite of its disadvantages, to be superior to all other iodine preparations in syphilis, and suggests the following formula as an effectual means of its administration: Potassium iodide, 7; iron and ammonium citrate, 1; tincture of nux vomica, 2; distilled water, 7; tincture of cinchona, 28. Of this one teaspoonful contains 15 grains of potassium iodide. If the mixture is disagreeable to the patient because of its color or taste, strychnine may be substituted for the tincture of nux vomica, syrup of orange flowers for the quinine, and with the addition of essence of peppermint, a clear fluid results.—*Münchener medizinische Wochenschrift*, 1905, No. 13, p. 608.

Mercurial Irrigations in Gonorrhœa.—Dr. Paul Asch prefers a solution of mercury oxycyanide to one of mercury bichloride, the latter being likely to cause painful or perhaps impossible urination, as well as pain, while the former is free from these disadvantages, as well as being a more potent gonococcocide. He advises the administration of salol, or, better, of urotropine, in order to prevent ascending infection, and the tamponing of the infiltrated areas in the urethra with iodine tincture through the urethroscope.—*Münchener medizinische Wochenschrift*, 1905, No. 25, p. 1197.

PEDIATRICS.

UNDER THE CHARGE OF

LOUIS STARR, M.D.,
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AND

THOMPSON S. WESTCOTT, M.D.,
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Observations Concerning Epidemics of German Measles.—The three epidemics of German measles observed by H. BAHRDT (*Münchener medizinische Wochenschrift*, 1905, Bd. lii., No. 20, p. 940) occurred during the years 1900, 1903, and 1904. The cases occurring during each epidemic were remarkably alike, but the epidemics differed from each other in many respects. The points which they had in common were: not one of them was very extensive, all the patients were children, many children exposed to the disease escaped, and there were neither grave symptoms nor complications. Many of the rötheln patients had previously passed through an attack of ordinary measles; in all of them the infection could be traced to a previous case. The epidemics had their origin in kindergartens, spreading thence to the homes of the patients. The period of incubation varied from twelve to nineteen days; most of the cases presented no prodromal symptoms; when existing they were noted for from two to four days and consisted of catarrhal inflammation, fever, nausea, vomiting, and nosebleed. The initial eruption, when observed at all, consisted of a diffuse redness. In 10 of the 46 cases Koplik's spots (?) were observed, but in none of them before the exanthem appeared. Many of the cases presented a distinct enanthem, such as is never seen in measles. The eruption differed in the three epidemics; it was pale red in color in the first and third, dark red in the second; in the first it appeared on the face, in the others over the trunk; the spots of the first and third were numerous, closely aggregated, small and flattened; the size varied from 1 to 4 mm.; in the second they were few, widely separated, up to 2 cm. in size, and elevated like hives. The eruption lasted two to three days in the first epidemic, two to eight days in the second, and one to three days in the third. Relapses were seen twice; desquamation was noted in only a few cases. The fever appeared before the eruption (from one to three days), and in the first two epidemics did not go above 100.5°; in the third epidemic it usually reached 102°, and in a few cases 103.5°. Enlarged cervical glands were but rarely observed. Of complications, there were 3 instances of bronchitis, 3 of enteritis, and 1 of otitis. Even though there was a marked difference between the three epidemics, the author is not inclined to speak of different varieties of the disease, and particularly warns against describing new infectious diseases as long as their etiology is unknown to us; a new variety of acute exanthematous fever should only then be considered, where a distinct immunity exists against all others known.

Treatment of Scarlet Fever with Antistreptococcic Serum.—F. GANGHOFNER (*Deutsche medizinische Wochenschrift*, 1905, Bd. xxxi., Nos. 14 and 15, pp. 529 and 592) reports having treated 15 cases of scarlet fever (2 moderately grave and 13 very grave) with Aronson's antistreptococcic serum, but without noting any marked influence on the course of the disease. From 10 to 30 c.c. were injected at a dose, and in some instances this dose was repeated the next day; 7 of the patients died; neither the temperature nor the general condition of the patients was influenced by the doses used, but Ganghofner suggests that larger doses probably would be more influential. Eight cases were treated with Moser's serum with about the same results as with the other serum; 3 of the patients recovered, 5 died; only 2 (both recovered) were treated during the first forty-eight hours of the disease. The temperature and the general health seemed to be more favorably influenced, but the improvement did not last. As the number of cases here reported is small and as probably the serum was weaker than it should have been, Ganghofner expects to continue his observations.

An Atypical Case of Measles.—E. HAMBURGER (*Deutsche medizinische Wochenschrift*, 1905, Bd. xxxi., No. 21, p. 832) reports the case of a child, who, with her sister, developed first chickenpox, then measles; the chickenpox of both and the measles of the sister passed off without anything remarkable occurring. The other case, however, presented more atypical than typical features. It began with moderate fever, a few cutaneous hemorrhages and Koplik's spots; without the latter the diagnosis of "measles" could not have been made at all. Two days later, these signs having disappeared, the temperature rose to 104° and later to 106°; the urine reacted to the acetone test, the child became apathetic, and an erysipeloid erythema appeared in different parts of the body. The high temperature remained, but the erythema was fugacious, to reappear every day in a different place. Desquamation was the next sign. Considering the condition of a septic nature, unguentum Credé was ordered. It was several days more—eight days from the time the Koplik's spots had appeared—before the typical measles eruption broke through, and from then on the case passed off quite normally, beyond a slight albuminuria which existed for a short time. The case teaches the value of Koplik's spots, as without them the diagnosis would certainly not have been made.

The Importance of Koplik's Spots for the Diagnosis and Differential Diagnosis of Measles.—The importance of the spots first described by Koplik has been discussed by a large number of observers of all lands, without, however, bringing the subject to a definite conclusion. H. BRUENING (*Deutsche medizinische Wochenschrift*, 1905, Bd. xxxi., No. 10, p. 384), having the opportunity to observe very carefully a number of cases of measles, which occurred in one of the hospitals of Leipzig during the course of other diseases, paid particular attention to the existence of these spots. Of 52 such cases, developing under his eyes, 50 presented Koplik's spots; in 3 instances they were seen six days, in 3 five days, in 4 four days, in 7 three days, in 11 two days, and in 25 one day before the appearance of the characteristic eruption. In most instances they disappeared before the measles came out, so that in only 17 cases were the two eruptions coexistent. In 2 cases they were

present to the end of the disease, and disappeared simultaneously with the cutaneous eruption. The spots themselves, varying in number, were mostly very small in size; their seat of predilection was about the back part of the mucous membrane of the cheek in the neighborhood of Steno's duct, but they were also found about the lips, gums, and hard palate. In most cases they were seen as soon as the mouth was opened; in a few others not until a careful inspection was made. Diffuse daylight is a better light for their observance than artificial light. The spots are bluish white in color, the size of a pinhead, and surrounded by a red areola. Bruening looked for them in many other affections (German measles, scarlet fever, serum eruptions) without, however, being able to find them in any one of them. He, therefore, concludes that Koplik's spots are always present in measles and are pathognomonic of the exanthem; their presence is of the greatest importance from a diagnostic, differential diagnostic, and prophylactic standpoint.

OBSTETRICS.

UNDER THE CHARGE OF

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Vaginal Ovariotomy during Labor.—PETERSEN (*Monatsschrift für Geburtshülfe und Gynäkologie*, 1905, Band xxi., Heft 6) reports the case of a primipara with moderately contracted pelvis, in whom the pelvic cavity was partially filled by a tumor. Combined examination showed that it was impossible to dislodge this from the pelvis. The consistence of the tumor suggested an ovarian cyst. The patient was clearly at full term, and the head of the child was movable above the pelvic brim.

Vaginal incision was made; adhesions about the tumor were loosened, causing free bleeding, and the tumor was incised. Its contents seemed to be fluid and escaped easily; the sac was then drawn out and the pedicle ligated at the right broad ligament. So soon as the tumor was removed, the head of the child descended and made it impossible to accurately close the vaginal wound, accordingly, the child was delivered by forceps and incisions made in the cervix prevented lacerations. After the uterus was empty lacerations were closed, and the incisions which had been made after the removal of the tumor were brought together.

Cæsarean Section on the Dying.—In the *Zentralblatt für Gynäkologie*, 1905, No. 23, FUTH reports the case of a multipara who suffered from very severe lesions of the heart with dyspnœa and cyanosis. The patient was pregnant at term, and was brought into the clinic in a very grave condition and unconscious. Medical treatment failed to improve her condition; the patient was thought to be dying, and to rescue her child it was delivered by Cæsarean section. This was done in the same careful and thorough manner in which the operation would be performed upon the living. The patient, however, seemed temporarily better after the operation, but died suddenly on the fifth day. Autopsy revealed chronic endocarditis with severe valvular lesions.

In the discussion upon this paper, Zweifel reported a case in which a pregnant woman having a brain tumor was thought to be dying at the termination of pregnancy. She had high fever and had been for some time unconscious; the child was removed by Cæsarean section with the hope of saving its life. It was, however, dead, and upon autopsy ecchymoses were found throughout all the serous membranes. Zweifel believes that operation should be done in all cases where the mother is fatally ill, with the hope of saving the child.

Myasthenia Complicating Pregnancy and Resulting in Cæsarean Section.—GEMMELL (*Journal of Obstetrics of the British Empire,* April, 1905) reports the case of a married woman, aged twenty-five years, who, during a pregnancy, had progressive muscular weakness, which was diagnosed as severe myasthenia. The muscles were all weak, even those supplying the organs of the special senses acted very deficiently. The patient's condition became so bad that it was impossible for her to perform the most trivial acts for herself without the greatest exhaustion and alarming dyspnœa.

On admission to the hospital she had repeated attacks of dyspnœa and slept but very little. As the patient continued to grow worse, it was decided to deliver her by Cæsarean section, with the hope that she would improve. The operation was successful and the patient recovered from it without infection. She recovered some time after the operation, but continued to be helpless. The child was well nourished. After leaving the hospital her attacks of dyspnœa ceased. There was no other considerable improvement.

Thirty Cases of Cæsarean Section.—In the *American Journal of Obstetrics,* June, 1905, KERR, of Glasgow, publishes a paper reporting 30 cases of Cæsarean section. His mortality was 2 deaths, 6.6 per cent.; other figures give a mortality from 6.8 to 8 per cent. One of Kerr's fatal cases resulted from hemorrhage; at its autopsy several of the catgut uterine sutures were untied. His second fatal case resulted from septic infection, as the patient had been in the hospital but a short time before delivery. There was a morbidity of 26.6 per cent.; 1 patient having mitral disease and suffering greatly from bronchitis, while another had pleuropneumonia; 2 patients had foul lochia, with fever and rapid pulse, and were given intrauterine douches. One case had double parotitis; in 1 case suppuration occurred about the uterus, and free incisions were made in the cellular tissue. This was a case of celiohysterectomy, in which the stump was dropped. The patient was very ill for a time, but after the incisions and discharge of pus occurred she recovered.

Kerr cleansed the vagina very thoroughly before he operated. In his cases he had 23 in which the uterus was retained, with 2 deaths, a mortality of 9.8 per cent. In 7 cases, in which the uterus was removed and the stump dropped, there were no deaths. The morbidity in the first series was 28 per cent., and in the latter series 25 per cent. He believes that hysterectomy is the safer operation.

He believes that resection of the tubes should be performed in emergencies where the operator has not sufficient assistance and must operate in a private house. Kerr has had 1 case of rupture of the uterus through a fundal scar after a former Cæsarean section; the patient was operated upon the second time with a good recovery.

In operating he uses lysol to cleanse the vagina and during operation normal salt solution for his hands and swabs. He has as few assistants as possible to come in contact with the patient. In multiparæ he does not wait for labor to begin. In primiparæ, if the uterus is to be retained, he waits until there is sufficient dilatation to secure drainage. If the uterus is to be removed, it can be opened most conveniently upon transverse incision. In one case only has he seen the uterus remain without contracting after it was emptied. If the membranes have ruptured before the operation, the uterus should be turned out of the abdomen before it is opened. For suture in the uterus, he prefers catgut, because in two cases where he used silk stitch infection followed, and patients were annoyed by discharging sinuses.

Rapid Dilatation of the Cervix.—De Seigneux, of Geneva (*Zentralblatt für Gynäkologie*, 1905, No. 23), illustrates his metal dilator and recommends its use. He also reports seven cases delivered by this method.

The instrument resembles Bossi's dilator, but the blades open in four directions. One of these blades bends downward and outward toward the operator; another downward and backward away from him, while two lateral blades open at right angles on each side. The instrument seems to have some advantages over Bossi's dilator, and is worthy of trial.

Cæsarean Section Late in Labor.—Holmes (*American Journal of Obstetrics*, June, 1905) reports the case of a primipara with contracted pelvis who had long been in labor and in whom forceps had been applied twice in the endeavor to deliver the child. The patient's pulse was 120 to 130, the temperature normal, and the right parietal bone presenting. The fetal heart sounds were 140, strong and regular. Pads and sponges were improvised and boiled for an hour. The abdomen was opened, the uterus turned out, and the child delivered by anterior incision. The placenta was on the anterior uterine wall and escaped as the uterus was opened. A rubber tube was placed about the cervix, as there were few assistants and some hemorrhage. The uterus was closed with catgut, and four silk sutures were added in addition. Salt solution was given subcutaneously during the operation.

The patient's pulse was 150 at the conclusion of the operation, but gradually declined, and the highest temperature was 101° at the end of the first day. The lower angle of the abdominal wound did not unite by first intention, but pus was not present. The patient did not nurse her child.

The child weighed eight pounds, and its head showed evidence of pressure by the pelvis and by the forceps.

He reports another case in which a patient with contracted pelvis was admitted to a hospital after she had been sometime in labor. The patient would not make a decision as to the choice of operation, and finally Cæsarean section was performed after the patient had been in labor forty-eight hours. She died of peritonitis.

The author believes that in the first case reported the uterus should have been removed and that a ligature should not have been placed about the cervix; in the second case he believes that no choice as to the kind of operation should have been presented to the patient and her family, but that Cæsarean section alone should have been urged.

GYNECOLOGY.

UNDER THE CHARGE OF
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Is Cancer on the Increase?—JULIUSBERGER (*Zeitschrift f. Krebsforsuchung; Rev. d'obstétrique et de gyn.*, 1905, No. 7) publishes a series of statistics based on those of the most prominent German insurance companies. One company found that the total mortality from cancer from 1885 to 1899 was 7.08 per cent. During those periods of fifteen years each the writer found that there was a progressive increase in mortality from this disease of 1 per cent. in males and 1.5 per cent. in females. Women of the upper classes were far more prone to the disease than were those in the lower walks of life. Fifty years was the most frequent time of development. In at least 45 per cent. of the cases the stomach was the seat of the disease.

Prevention of Conception.—BOSSI (*La gynécologie*, June, 1905) handles this delicate subject plainly, but without giving offence. Abortion as a means of carrying out Malthusian ideas he dismisses as in every way objectionable on physical, as well as on moral grounds. He goes so far as to affirm that surgeons are much to blame for resorting too readily to oöphorectomy and hysterectomy, without paying sufficient attention to the subsequent effect of the operation upon the nervous system and the functions of metabolism.

The use of artificial means to prevent impregnation, incomplete coitus, etc., result not only in serious nervous disturbances, but are responsible for many cases of metritis and oöphoritis. Histologically, the writer has traced the evil results of these practises in the uterus, in which arterial and venous congestion is followed by degeneration of the vessel walls, atrophy of the fibromuscular tissue, connective-tissue hypertrophy, and finally by sclerosis. The clinical symptoms are menorrhagia and metrorrhagia, secondarily amenorrhœa, defective metabolism, and nervous disturbances, and finally complete sterility. The writer urges the propriety of physicians and sociologists uniting in their efforts to oppose the spread of the Malthusian ideas that have become so general in all countries.

[American readers need only to recall Goodell's classical chapter on this subject to feel that the writer has only presented anew a question of vital importance, which has been too little heeded since our lamented confrère presented it in his clear and convincing style so many years ago.—H. C. C.]

Perforation of the Uterus Due to Muscular Relaxation.—TUSSENBROEK (*Zentralblatt f. Gynäkologie*, 1905, No. 34) affirms that in nearly every case of curettement a distinct contraction of the uterine muscle

is observed. Exceptionally the non-puerperal uterus does not respond to the stimulation of the curette, but remains as a flabby sac, the wall of which can easily be perforated. He discusses at length the question whether Kossmann is correct in his assertion that physiological paralysis of the uterus is possible, as denied by Strassmann, and agrees with the former.

According to the writer's opinions, based on measurements of the uterine cavity before and after dilatation of the cervix, stretching of the cervix alone may cause paralysis of the uterine muscle, which may be increased by the subsequent curettement.

Indications for Vaginal Hysterectomy.—FAURE (*Soc. d'obstet. de gyn. et de pæd. de Paris; Zentralblatt f. Gynäkologie*, 1905, No. 34) thinks that in spite of the advantages of the abdominal route, those afforded by the vaginal should not be overlooked. Laparotomy is preferable for the removal of the myomatous and cancerous uterus, except in cases of beginning cancer of the portio. Conservative operations on the adnexa are best performed through an abdominal incision, but colpotomy is preferable in the presence of acute suppurative disease.

RICHELOT (*Ibid.*) thinks that the vaginal route is becoming less popular, though he prefers it to radical abdominal extirpation of the cancerous uterus, since the immediate and remote results of the latter have not been satisfactory. In the case of pelvic suppuration either route may be adopted, the choice depending upon the nature of the individual case.

Intestinal Colic of Pelvic Origin.—LABORDE (*Paris Thesis;* abstract in *Zentralblatt f. Gynäkologie*, 1905, No. 35) believes that these cases are usually accompanied by obstinate constipation and mucous colitis and occur in connection with dysmenorrhœa or periuterine inflammation. If localized these cramps may simulate appendicitis or renal colic, or even cancer of the intestine, if a fecal mass is present at the junction of the transverse and descending colon. Hence the necessity of a careful review of the case and thorough evacuation of the bowels.

Primary Amenorrhœa.—V. LE LARIER (*Paris Thesis;* abstract in *Zentralblatt f. Gynäkologie*, 1905, No. 35) includes under this head absence of menstruation at puberty not due to congenital atresiæ. He distinguishes three varieties, viz.: 1. Cases without discoverable cause, in which the genital organs are apparently perfectly normal. 2. Those due to some congenital defect. 3. Amenorrhœa accompanying some general disease, as diabetes or tuberculosis. In the first local or general treatment may cause appearance of the menses, the prognosis in the other two varieties being unfavorable. The writer cites a case in which menstruation occurred after grafting of a healthy ovary from another subject in the uterine wall.

Conservative Treatment of the Uterus and Adnexa.—DEVANASSOUX (*Paris Thesis;* abstract in *Zentralblatt f. Gynäkologie*, 1905, No. 35) pleads for the conservation of an ovary or a portion of the same in all operations on young women, with the primary purpose of preserving

the functions of menstruation and avoiding the disturbances due to the artificial climacteric. Even in double salpingectomy this object should be aimed at. The writer admits that the results are not always satisfactory, since while some patients are perfectly well after the operation, in others the pelvic pains persist, so that in a small proportion of the cases a second laparotomy becomes necessary.

Racemose Cysts of the Ovary.—BENDER (*Paris Thesis;* abstract in *Zentralblatt f. Gynäkologie*, 1905, No. 35) describes under this term a peculiar form of ovarian cysts, which consists of grape-like masses attached to a common pedicle and quite different in appearance and structure from ordinary multilocular cysts. They are rare and may be single or double, the entire ovary or only a portion of it being involved. These peculiar neoplasms may be either "fibrous varicosities" or fibropapillomata, which develop from the surface of the ovary. The diagnosis before operation is difficult on account of the softness and mobility of the tumors. The prognosis is favorable, if the cyst is entirely removed.

Extirpation of the Endometrium.—FRANK (*Münchener med. Wochenschrift*, 1904, Nos. 46 and 47) states that the technique of the operation is simple. The uterus is bisected per vaginam and the entire mucosa is peeled off down to the subjacent muscular layer as high as the fundus, where it is ligated, the hemorrhage being slight. The opposed raw surfaces are then sutured with buried catgut, so that the vagina becomes a cul-de-sac. Care must be taken that no fistulous opening remains, since the writer cites such a case in which conception afterward occurred. The operation is indicated in preference to hysterectomy in cases of obstinate climacteric hemorrhages, in disease of the bloodvessels leading to the profuse bleeding, in severe neuroses of endometrial origin, and in chronic endometritis with intractable retrodisplacement or prolapse in old subjects.

Unlike hysterectomy, "endometrectomy" is unattended by subsequent nervous disturbances or painful cicatrices and adhesions. Moreover, there are no disagreeable results such as follow the division of nerves and vessels; in fact, the disadvantages of opening the peritoneal cavity are entirely eliminated.

Physiological Hysteropexy.—GOUIN (*La gynécologie*, August, 1905) concludes an article with this title as follows: 1. Ventrofixation and vaginofixation of the uterus are unphysiological and dangerous operations, which should not be practised in women who are still capable of childbearing. 2. Intra-abdominal shortening of the round ligaments, on the contrary, is a natural and physiological procedure, and should be the operation chosen in all women during the period of sexual activity, its advantages being the fact that the uterus is left in the position most favorable to conception, that dystocia or interruption of pregnancy does not follow, and that the organ remains in its normal relation after involution has occurred. 3. Intra-abdominal shortening of the ligaments is preferable to Alexander's operation, since it is possible to separate adhesions, to investigate the condition of the adnexa, and especially to attack the ligaments in such a way as to secure permanent results.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

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Pathogenesis of Maxillary Empyema.—Dr. Georges Mahu, in a preliminary communication (*Annales des maladies de l'oreille et du Larynx, etc.*, August, 1905), concludes, as a result of the examination of 50 cadavers—that is to say, 100 maxillary sinuses—that he did not find a single true chronic sinusitis of dental origin in the whole 100 sinuses examined. Hence, it may be inferred that a maxillary empyema of dental origin is with difficulty transformed, or at any rate very slowly, into a true chronic sinusitis. He emphasizes the importance of precise diagnosis between these two affections. In the one the walls of the sinus are diseased and secrete the pus; the other, there is the breach of continuity in the walls of the sinus which gives ingress to pus from without. True sinusitis cannot be cured without curettage, while in maxillary empyema cure is obtained on disappearance of the cause of the suppuration, most frequently by the extraction of a tooth.

Osteomyelitis of the Upper Jaw with Ethmoiditis and Empyema of the Sinus.—Lubet-Barbon and F. Furet (*Annales des maladies de l'oreille, du larynx, du nez et du pharynx*, September, 1905) report an instructive case in a girl aged fifteen years. This case was submitted to a number of operations under the impression that the disease was due to suppuration of the sinus, and it was not until a year after its presentation, when already of seven or eight months' duration, that the true nature was revealed by an unilateral Rouge operation, lifting the soft parts from the bone and revealing an ostitis of the maxillary bone. The cavity had been merely a receptacle, in which the pus from the diseased bone accumulated. Five months after this last operation the patient was apparently well, but was still showing evidences of continuous ethmoiditis.

Diphtheria Antitoxin in the Treatment of Goitre.—Dr. Robert T. Legge, of McCloud, Cal. (*Journal of the American Medical Association*, April 22, 1905), reports two cases satisfactorily treated intentionally, after he had witnessed an accidental case of cure in a patient whom he had injected prophylactically for diphtheria.

Tuberculosis of the Tonsils.—In an article on "The Significance of Tuberculous Deposits in the Tonsils," read before the American Medical Association (*Journal of the American Medical Association*, May 6, 1905), Dr. George B. Wood, of Philadelphia, states that from clinical data collected in literature and from postmortem examinations made by himself, it is evident that in cases of pulmonic phthisis secondary

infection takes place more readily in the tonsils than in any other part of the respiratory tract. A summary of the literature and a detail of some experiments upon animals are presented in evidence. He finds that the faucial tonsils become inoculated in nearly all cases of advanced pulmonic phthisis, and that some form of primary tuberculosis will be found in about 5 per cent. of the cases of hypertrophied pharyngeal tonsils.

Cicatricial and Constrictive Stenosis of the Larynx after Intubation in Diphtheria.—A study of certain complications and the sequels met in operative cases of laryngeal diphtheria by Dr. B. Franklin Royer, Chief Resident Physician of the Municipal Hospital of Philadelphia (*American Medicine*, October 28, 1905), presents a very thoughtful exposition of the various sources of trouble, and the most suggestive methods of overcoming them. These difficulties are attributed to reflex apnœa, atony of the abductor muscles from the pressure of the tube, pressure upward and exhaustion of the adductor muscles, and pathological changes in the soft structures of the larynx and trachea, with other sequelæ. It is intimated that some of these complications may be avoided by at least temporary removal of the intubation tubes at the end of forty-eight hours of insertion.

The doctor advises avoidance, if possible, of tracheotomy, as the patient is frequently unable afterward to breathe without the tube.

Rupture of the Œsophagus Due to Vomiting.—This case is reported by Dr. P. L. Gunckel, of Dayton, Ohio (*American Medicine*, October 28, 1905). Autopsy revealed a perpendicular rent in the œsophagus, three-quarters of an inch in length and one-half inch above the diaphragm on the left side. The left pleural cavity was filled with water, blood, and the contents of the stomach. The stomach was greatly dilated; all the other organs were apparently in a normal condition.

Laryngismus.—Dr. Collet, of Lyon (*Annales des maladies de l'oreille, du larynx, du nez et du pharynx*, September, 1905), reports a case of relief of the laryngeal spasm of tabes by the administration of santonin, 15 cg. doses, three times a day, in a woman aged fifty-one years, who denied or ignored any specific antecedent. The medicine was continued nearly two months without any inconvenience. The spasms continued absent between seven and eight months after the medicine had been suspended, when they recurred and were again controlled by the administration of the santonin.

Papillomatous Growths of the Larynx in Children.—Dr. L. D. Brose, of Evansville, Ind. (*Journal of the American Medical Association*, March 18, 1905), reports two cases: one in a lad, aged eleven years, and the other, presumptively congenital, in a female infant of nineteen months. The growths were satisfactorily removed—from the boy, with the intralaryngeal snare under cocaine anæsthesia, and in the infant, with the knife and snare after exposure by partial thyrotomy.

Dislocation of the Thyroid Cartilage.—Dr. Frank W. Smithies, of Chicago (*Journal of the American Medical Association*, July 1, 1905), reports a case of dislocated thyroid cartilage of the larynx in a man

aged twenty years, who was hit or kicked in the front of his neck in a football game. When examined it was apparent that the thyroid cartilage had been sprung, as it were, from its seat on the cricoid, and at the same time had suffered a rotation in a vertical direction. The inferior border of the thyroid cartilage was about one-sixth of an inch below its resting place on the cricoid.

The cartilage was replaced by careful digital manipulation, and was maintained in position with adhesive strips placed horizontally. At the end of five weeks the patient had practically recovered.

Foreign Bodies in the Lungs.—Dr. E. Fletcher Ingals, of Chicago (*Journal of the American Medical Association*, May 27, 1905), reports a case in which he successfully removed a collar-button from the lungs under bronchoscopy.

Tracheotomy Wounds.—Dr. Miles F. Porter, of Fort Wayne, Ind. (*Journal of the American Medical Association*, April 8, 1905), advocates the immediate closure of the trachea with suture as lessening the dangers from pneumonia and infection, shortening the convalescence and reducing the deformity of the scar to the minimum.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Experiments in Congenital Transmission of Tuberculosis and Congenital Tuberculosis.—The transmission of tuberculosis from the mother through the placenta to the child is known to occur, and Friedmann (*Virch. Arch.*, 1905, Bd. clxxxi. p. 150) has collected 22 cases from the literature in which a placental infection in human beings was proven through anatomical study, while including the observations upon animals upwards of 100 such instances have been recorded. On the other hand, direct evidence to show that tuberculosis can be acquired by the child from the father is almost lacking. Only two cases which suggest this method of transmission have been reported—one by Sarwey, the other by Landouzy. Klebs, however, has stated that "tuberculosis of the father is ten times more dangerous for the child than tuberculosis of the mother."

Bearing upon this question, Friedmann's experiments are of much interest. A series of inoculations of human tubercle bacilli and the

bacilli of Perlsucht were made into both male and female rabbits and guinea-pigs; one infected animal was allowed to copulate with a healthy animal and after a short time the embryos examined. In the first series the inoculation was made into the vasa deferentiæ of buck rabbits and the embryos of the healthy female, impregnated seven to eight weeks after the injection, were examined seven days after copulation. In these embryos tubercle bacilli, as a rule, could be demonstrated, though they occurred in small numbers. In a second series the testicles of buck rabbits and guinea-pigs were inoculated in the same manner as before and the infected males allowed to copulate with healthy females. Seven-day embryos showed as before tubercle bacilli in small numbers. If, however, the coition were prolonged for four weeks or longer after the inoculation of the testicle, conception did not take place.

Thirdly, experiments were made with buck rabbits which had received intrapulmonary and intraperitoneal injections of tubercle bacilli. The seven-day embryos, the fathers of which had a pulmonary infection, showed no tubercle bacilli, and if the pregnant females were allowed to go to term they gave birth to healthy young. After intraperitoneal infection successful impregnation was rare.

Finally buck rabbits were given an intravenous injection of tubercle bacilli and the result in the impregnated healthy female studied. Six-day embryos showed at times a few tubercle bacilli. If the infection of the male were extended to three weeks or longer before copulation the six-day embryos contained no tubercle bacilli, although the organs of full term newborn of mothers impregnated by such fathers showed a few scattered tubercle bacilli. These proved to be avirulent.

The results from the primary inoculations of the females was somewhat different. Female rabbits, immediately after copulation with healthy males, were injected intravaginally with human tubercle bacilli and the bacillus of Perlsucht. One lot of these females was killed after seven days and the embryos examined; one lot allowed to come to term, and some of the newborn examined immediately, while others were allowed to grow up.

On examination the seven-day embryos were found to contain tubercle bacilli. But their presence seemed in no way injurious to the growth of the fetus, for the full-term young showed exceedingly few tubercle bacilli, while those allowed to live grew to be such healthy animals that they could not be told from the controls. The author suggests that these results may be due to the fact that the rabbit is relatively insusceptible to the human tubercle bacillus.

Female rabbits inoculated intraperitoneally and intravenously with tubercle bacilli became pregnant and developed embryos which were tubercle-free; provided copulation with the healthy male was not too long deferred, for if the infection was widespread conception did not take place. After intravenous injections tubercle bacilli passed through the placenta into the organs of the fetus, where, however, they were avirulent.

Finally a histological examination was made of the testicles and epididymes of six individuals who had died of pulmonary tuberculosis. No sign of tuberculosis could be discovered in these organs, and in only one instance could a few tubercle bacilli be demonstrated. In this case a very few bacilli were found in the sheath of the testicular tubules and in the epididymis.

From these experiments the author concludes that tubercle bacilli may pass into the fertilized ovum, which is not destroyed by the bacillary invasion, but develops into a fetus. The bacilli transmitted by conception may be present in the organs of the embryo. This, nevertheless, does not prevent full growth of the rabbit embryo, which does not become tuberculous, even for a short period after birth.

Studies on the Pneumococcus under the Auspices of the Medical Commission for the Investigation of Acute Respiratory Diseases of the Department of Health of the City of New York.—The work done so far under the auspices of this commission is published in full in the *Journal of Experimental Medicine*, 1905, vol. vii., No. 5. The entire number, a large one, is devoted exclusively to studies upon the pneumococcus made by different investigators, and presents the results of the work upon some of the problems suggested by the commission.

An article by Park and Williams forms the first contribution. These authors conclude that typical pneumococci are present during the winter months in the throat secretions of a large percentage of healthy individuals in city and country. A larger percentage of atypical strains were obtained from healthy persons than from those suffering from pneumonia. Many of the atypical strains seem to be closely related to the streptococci. The so-called streptococcus mucosus Schattmüller, which has hitherto been classed with the distinct streptococci, is placed as a definite variety among the pneumococci, and it is recommended that the name be changed to streptococcus lanceolatus, var. mucosus. A lower percentage of the strains of pneumococci virulent for rabbits in the doses used has been obtained from normal cases by rabbit inoculations of mass cultures than from cases of pneumonia by the same method. Since for several reasons the virulence of pneumococci from cases of human infection is probably increased for human beings, cases of pneumonia should be considered to a certain degree as contagious.

The authors were able to demonstrate by repeated inoculations of a pneumococcus into sheep a specific protective power of the sheep's serum for mice against the homologous strain and against certain other strains. Coincident with this production of protective power, a slight specific increase of the sheep serum in phagocytic power in vitro has been observed with strains of pneumococci; all strains of streptococcus lanceolatus, var. mucosus, act similarly with the serum produced by the inoculation of one strain; the strains of some other varieties have shown no definite relationship between the phagocytic power and the protective power of the serum.

Katherine R. Collins (p. 420), from her experiments on the agglutination of pneumococci, concludes finally that at present it is not possible to establish a definite relation between the agglutination reaction and the other characteristics of the pneumococcus excepting in the case of the pneumococcus mucosus (streptococcus lanceolatus, var. mucosus). The pneumococci, by reason of their agglutinating properties, exhibit a tendency to separate into numerous groups similar to streptococci.

Longcope and Fox (p. 430) find it possible to separate the pneumococci obtained from the saliva of healthy persons into two groups. One of these groups corresponds with the typical pneumococcus

obtained from the consolidated lungs of persons dying of pneumonia. The organisms in this group, with one exception, fermented inulin and showed varying grades of pathogenicity for animals. Forming the other group were atypical pneumococci, which approached more closely in many characteristics the streptococcus than the pneumococci. The organisms did not ferment inulin and were practically non-pathogenic for rabbits and mice. This group of organism was found much more frequently in the saliva of healthy individuals in the late spring months, while the typical pneumococcus predominated during the winter.

Norris and Pappenheimer (p. 450), from their investigations upon pneumococci and allied organisms in human mouths and lungs after death, conclude that organisms of the pneumococcus or streptococcus group are present in the lungs of practically all cases, whether normal or showing a variety of lesions. They were found in 40 out of 42 cases. The pneumococci and streptococci were found in practically similar percentages; that is, in 50 per cent. of the cases. It was discovered, however, that cultures of bacillus prodigiosus introduced into the human mouth after death were conveyed to and recovered from the lungs by culture in a little over half of the cases in which this experiment was tried. The test micro-organisms are, the authors believe, conveyed to the lungs with the fluid which collects in the mouths of persons after death, and which in many cases collects just before death. The cultural finds, therefore, after death are no guide to the bacterial contents of the lungs during life, and any deductions made from such findings are deceptive. It was discovered that there is a group of diplococci, intermediate between the typical pneumococci and streptococci. The diplococci of this type have been found in 40 per cent. of the cases. The differential diagnosis between this group and the typical pneumococci is difficult, there being no one criterion of differentiation. Members of this group have been found in the blood during life and in the pial exudate of cases of meningitis.

Duval and Lewis (p. 473) pay especial attention to the presence and distribution of pneumococci and streptococci in the lung at autopsy. The pneumococcus is to be found practically always at autopsy in the lungs of persons dying with lobar pneumonia; moreover, it is found in the healthy as well as the diseased portions of the lungs. It was further noted that streptococcus pyogenes and the pneumococcus are found in much the same places and under the same conditions, while very often they occur together. Pneumococci were isolated in every instance from the saliva of 24 healthy individuals. The authors, by careful titration of the acidity, produced by the various strains of pneumococci grown in inulin bouillon, have divided this general group into two sub-groups: *a*. Inulin fermenters. *b*. Non-inulin fermenters. Under the first group there are three sub-headings: (1) High-acid producers; (2) medium-acid producers, and (3) low-acid producers. Streptococcus mucosus is regarded as a highly specialized pneumococcus.

Buerger (p. 497) demonstrated the presence of the pneumococcus in the mouths of 50 per cent. of 78 normal individuals. He finds that in certain cases the pneumococcus is regularly present during long periods of time, while in other instances the organisms can only be demonstrated in the mouth for a few days. Further investigations seemed to show that the pneumococcus might be acquired by a person whose mouth was free from this organism when he came in close and constant con-

tact with an individual harboring the organism in his buccal secretions. The handkerchiefs and dishes of pneumonia and "positive normal" cases may be regarded as a means of transportation of the pneumococcus from person to person. The pneumococci isolated from the mouth of normal individuals possess the usual morphological and cultural characters observed in the organisms isolated from other sources. All the pneumococci studied possessed the power of splitting inulin with the formation of acid. By means of a new stain which the author has devised he believes that he can differentiate the pneumococcus from allied organisms by its morphology alone. There are doubtful diplococci of atypical morphology which can be grouped neither with the pneumococci nor with the streptococci, although they have many features in common with both. The author believes that the streptococcus mucosus capsulatus belongs to a group which is related to but distinct from the pneumococcus. All pneumococci, irrespective of their source, were agglutinated by means of pneumococcus immune serum. An immune pneumococcus serum was found capable of agglutinating various pyogenic streptococci, certain atypical organisms, and several strains of the streptococcus mucosus capsulatus.

Hiss (p. 547) reports the results of his work with the various organisms sent to the central laboratory by the different investigators working under the auspices of the commission. From a careful study, particularly of the biology of these bacteria, he concludes that organisms, not to be distinguished by morphological characters or by any physiological peculiarities from true pneumococci derived from pathological sources, occur with frequency in the mouths of healthy persons and those suffering from slight inflammations of the nasopharynx, and that the only legitimate conclusion is that these organisms are true pneumococci. There are, however, other organisms in normal mouths and from pathological sources that morphologically or by staining reactions are not definitely to be distinguished from pneumococci and can only be recognized by a careful study of their fermentative activities and agglutination reactions. These organisms are non-inulin fermenters. The organism known as the streptococcus mucosus is at times found in cultivation from the mouths of apparently healthy individuals, and though it shows certain peculiarities distinguishing it from the typical pneumococcus, it is probably very closely related to and a variety of the species. Besides the organisms of these groups there are other organisms which in their fermentations are indistinguishable from pneumococci, but which either morphologically or in agglutination reactions show a variation from this type. Some of these are probably modified pneumococci or streptococcus mucosus; others, it may be, are streptococci of types which it has not heretofore been possible to recognize and describe. Finally, it seems more than probable that practically every individual, at least during the winter months, acts as a host at some time or other, and probably at repeated intervals, of organisms of the true pneumococcus type.

Wood (p. 592) finds from a series of experiments that the life of the pneumococcus in moist sputum is of considerable duration, being less than two weeks if the sputum is not exposed to direct sunlight. Under ordinary conditions the bacteria are not given off from the moist sputum, but if it is dried the masses may remain virulent for a long time, and when powdered may be scattered over the floor or bedding. In the

powdered sputum, however, the bacteria die off rapidly, especially if exposed to sunlight or diffuse daylight, when they may perish within an hour. When a person suffering with a pneumococcus infection sneezes or coughs, particles of the sputum are expelled from the mouth which may contain virulent pneumococci. Such particles remain suspended in the air of a well-ventilated room for a number of hours; but whether remaining in suspension or deposited and dried upon articles of furniture, the author's studies show that the pneumococci in the spray becomes harmless in about an hour and a half, while many die within a few minutes.

Finally, Longcope (p. 626) describes certain reactions which were obtained by growing pneumococci and streptococci in the blood serum of pneumonia patients.

Histological Study of Arterial Atheroma.—O. JOSUE (*Jour. de physiologie et de pathologie générale*, 1905, T. vii., p. 690) presents the results of a careful microscopic investigation of the aorta and various arteries the seat of atheroma. Unna's orcein and Weigert's elastic stains were found especially useful in the study. The changes in the elastica were studied in particular, and the author finds in the arteries a division of the internal elastic coat with a pathological deposit of tissue where the division has occurred. Degenerated elastic fibres are to be seen in this pathological deposit, which is vaguely fibrillary and takes a deep red stain in eosin. It is divided into little structureless masses triangular in shape. In the aorta the lesion is more complex than in the small vessels, owing to more complex structure of the aorta. Here the calcareous degeneration is found in the deep part of the intima where the elastica joins the muscular elements of the wall. Where the intima is most thinned the greatest alterations are found in the elastic tissue of the media, which becomes rigid and much swollen. This tissue, the author thinks, becomes replaced by calcareous deposits. Josué has found lesions in the aortas of dogs treated by intravenous injections of adrenalin almost identical to those found in human atheroma. Thickening of the internal tunic by elastic and muscular hyperplasia with degeneration of the thickened areas occur in each. In man, however, the lesion lies more directly in the intima, while in dogs it lies on that edge of the intima which touches the media.

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